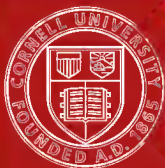


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# USEFUL CATHARTICS

A Series of Articles on the Use and Abuse of Cathartics  
with Suggestive Formulas and Recipes

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Chicago  
AMERICAN MEDICAL ASSOCIATION  
1920



## PREFACE

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The articles which follow originally appeared in the Therapeutics Department of THE JOURNAL of the American Medical Association. The interest with which they were received and numerous requests for publication in permanent form have caused collection in this book. Before the present publication, the articles were revised and rearranged in a logical arrangement.

AMERICAN MEDICAL ASSOCIATION.

Chicago, June, 1920.





## AUTHOR'S PREFACE

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When physicians no longer prescribe physic whether the patient needs it or not, when doctors cure and never cause the cathartic habit, when patients who require an evacuant are fitted carefully, skillfully and artistically with the very agent best suited for them, when medical students are taught therapeutics with sufficient thoroughness to enable them to prescribe the proper purge with intelligence and efficiency, when books on pharmacology and therapeutics adequately deal with the use of medicines—then, a publication like the present little book will no longer be required. May that day soon be here.

BERNARD FANTUS.



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## CHAPTER I

### THE USE AND ABUSE OF CATHARTICS

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#### CATHARSIS A CAUSE OF CONSTIPATION

That cathartics are a frequent cause of constipation may be gathered from such utterances as these:

In my opinion one of the most common sources of constipation in this country is the pernicious habit of resorting to the use of drugs to secure a daily stool. . . . If we except England, there is no other land in which chronic costiveness is so prevalent as it is here; and it is equally true that in no other land do people so frequently resort to the indiscriminate and senseless use of medicine in order to move the bowels. . . . It is a lamentable fact that not a few parents have the insane idea that, if they do not administer a cathartic frequently to their children, dire results will follow; and in their anxiety they eventually bring about or aggravate the very condition which they wish to avoid, namely constipation.<sup>1</sup>

A. C. Adams<sup>2</sup> would go so far as to prohibit the giving of cathartics to children, excepting under medical supervision. He urges that the medical profession attack the advertisements and display of aperients as inimical to the public health. With this we fully agree. The philosophy underlying the admission of cathartics into the advertising pages of newspapers and lay periodicals that discriminate against other forms of "patent medicines" displays the unfortunate lay notion that cathartics can do no harm. In point of fact, cathartics are not only habit-producing drugs; but, as in certain cases of intestinal obstruction, they may even kill.

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1. Gant, S. G.: *Constipation, Obstipation and Intestinal Stasis*, Philadelphia, W. B. Saunders, 1916, p. 69.

2. Adams, A. C.: *The Cause and Cure of Constipation*, Brit. M. J. 2: 315 (Sept. 21) 1918.

However, while entering on such a campaign, let us be sure that our own hands are clean. A cathartic prescribed by a physician is no less liable to produce the cathartic habit—a habit that means increasing ill health—than one taken by the patient on his own initiative. Indeed, when the physician prescribes the remedy, the patient feels all the more certain that it is good for him, and he is likely to continue taking it. After all, the medical practice of the laity reflects the past practice of the medical profession.

Cathartics produce constipation in several ways: Excessive evacuation does not leave enough residue to excite bowel movement the next day. The patient, believing or instructed that he ought to have a daily bowel movement, repeats the dose; and he is well started on the way to a drug habit. For now fatigue of the musculature from overstimulation, or muscular spasm from abnormal irritability of the mucosa, due to excessive irritation, are likely to assert themselves, leading to the necessity of progressive increase in dosage and potency of the drug. Even the mildest and blandest laxatives, as well as enemas, must be charged with a tendency to get the bowel into sluggish habits, for the very ease with which soft or liquid contents pass along the large bowel diminishes the necessity for muscular effort, and leads to atony and ultimate atrophy.

#### THE ACATHARTIC TREATMENT OF CONSTIPATION

In an extensive clinical study of constipation, Thayson<sup>3</sup> arrives at the conclusion that habitual constipation, as distinguished from secondary or symp-

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3. Thayson, T. E. H.: Bidrag til den Kroniske Habituelle Obstipations Klinik og Rontgenologi, Ugesk. f. Læger 81:4, 37, 91 (Jan. 2, 9, 16) 1919.

tomatic constipation, can be cured without the use of cathartics. This form of constipation usually begins before the age of 26 in women and 31 in men. The constipation beginning after these ages is generally secondary to some other disturbance. While he considers an atonic condition of the intestine, frequently hereditary, to be the predisposing cause in habitual constipation, yet he believes that acathartic treatment should be resorted to in such cases, and that such treatment is generally successful. By going to stool at a regular time each day, regardless of whether there is a desire or not, and devoting fifteen minutes to an effort to have a passage, natural movements can usually be secured by the third or fourth day. Now, if this can be done in middle life at a time when the constipation has become a habit of many years' standing, how much easier should it be to cultivate a correct habit in a little child, even though it had a hereditary tendency to constipation.

The psychotherapy of constipation, in which Paul Dubois<sup>4</sup> has been one of the most prominent pioneers, consists in implanting in the patient's mind the conviction that constipation is merely a faulty habit that can be overcome by proper hygiene and diet and without recourse to evacuants or enemas, and in antagonizing the fear that attempts at defecation will prove ineffectual. Frantic straining at stool may actually inhibit the process. Of course, before resorting to psychotherapy, we should first convince ourselves and, what is quite as important, the patient, by means of physical, roentgenographic and sigmoidoscopic examination that no organic disease of the bowel exists.

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4. Dubois, Paul: *The Psychic Treatment of Nervous Disorders*, New York, Funk and Wagnalls Company, 1906.

The psychic treatment is accompanied by correction of sins against hygiene. It is evident that those whose diet is at fault need diet and not drugs. The constipation of those with sedentary habits requires exercise—perhaps only calisthenics, walking, etc.—while those whose nervous system is below par from excessive work and worry need rest and recreation to enable the intestine to resume its proper function.

A word of warning should accompany even this treatment. The patient should be told that, if he does not succeed in obtaining a daily movement, it does not matter. We must not permit the patient to make of his bowel a fetish for daily and devoted worship. Says Samuel Jones Gee:<sup>5</sup>

Many of those who are continually complaining of constipation are suffering more from fear and hypochondria than from anything else. It is no law of nature that the bowels should be relieved punctually once in twenty-four hours. Some persons feel in better health when the bowels act once in two or three days; free evacuations are followed by a sense of weakness. Patience and contentment with nature's operations are not the worst remedies for constipation.

While this may be true of the adult, it must be admitted that it is probably just as undesirable for an infant to go for several days without an evacuation as it is to get it started on the cathartic habit. If the bowel is permitted to retain fecal matter for a long time, the rectal reflex becomes chronically dull.<sup>6</sup> To prevent this, when the infant's bowels have not moved for more than twenty-four hours, a soap suppository or a simple glass rod suitably bent as suggested by

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5. Gee, S. J.: *Medical Lectures and Aphorisms*, New York, Oxford University Press, 1908, p. 271.

6. Sutherland, G. A.: *Constipation in Children*, Latham and English System of Treatment, 2: 432.



Eggleston,<sup>7</sup> may be used. Of course, modifications of the diet, and giving an infant opportunity for exercise, are the chief measures to be employed in developing regularity of bowel movement in infants.



Bent glass rod to serve as substitute for suppository treatment.

### SPASTIC CONSTIPATION

In spastic constipation, cathartics, excepting the blandest of laxatives, such as oils, are contraindicated. When the patient suffers from colic—with or without

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7. Eggleston, Carey: Simple Appliance for Training Infants to Stool, J. A. M. A. 70: 156 (Jan. 19) 1918.

meteorism—when he has a feeling as though the evacuations were unsatisfactory, when he presses a good deal at stool and evacuates long, thin, flattened fecal masses (though they may have other shapes) and when, on palpation of the abdomen, one can roll colonic segments under the hand like cords, and on rectal examination the bowel fits closely around the finger like the finger of a glove, cathartics not only are useless but they aggravate the disturbance. In these cases, antispasmodic treatment is indicated.

#### PELVIRECTAL CONSTIPATION

In pelvirectal constipation (Hertz's<sup>8</sup> dyschezia), recognized by the fact that on roentgenologic examination the upper portions of the colon are emptied in the proper time, while the bismuth is retained for days in the sigmoid flexure and rectum, purgatives are likewise not only useless but harmful, as they can act only when fluid stools are produced, which at one and the same time wastes nutriment and leads to intestinal atony. It is characteristic for this condition that enemas act much better in producing evacuation than do physics given by mouth, a fact of which some of these patients are well aware. Here the most important part of the treatment is to keep the rectum and pelvic colon empty, so that these may in time regain their normal tone and irritability. This can be accomplished by the regular use of enemas or of suppositories. Increasing the irritability of the rectal mucosa by the use of appropriate irritants is also likely to have a curative tendency.

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8. Hertz, A. F.: Constipation and Allied Intestinal Disorders, London, 1909.

## REMOVAL OF IMPACTED FECES

For the removal of impacted feces enemas rather than purgatives should be used. The latter merely add to the colic which is usually present and which indicates that the intestinal musculature is already contracting excessively.

CONTRAINDICATION OF CATHARSIS IN ACUTE  
PAINFUL CONSTIPATION

In acute constipation, accompanied by severe abdominal pain, surgeons are agreed that purgatives are pernicious.<sup>9</sup> In this condition, the patient is not in danger because his bowels do not move: a person may have no bowel movement for a week without danger. The patient's danger lies in the condition that produces the pain as well as the obstipation. If the bowels can move, they will do so without recourse to drastic measures; if they cannot move, drastics will do great harm. When there is a complete mechanical closure of the lumen of the bowel, no cathartic, however strong, is capable of overcoming the obstruction. Instead of producing a bowel movement in these cases, the increased peristalsis forces intestinal contents back into the stomach, increasing the foul vomiting so characteristic of the condition; while at the same time the driving of the intestinal contents against the obstruction aggravates the damage existing at that point, leading to dilatation, sloughing, hemorrhages, and even perforation. If the obstruction is due to paralysis of the bowel from localized inflammation of the intestine, especially if the infection involves the peritoneum, the patient's comfort and safety depend

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9. Harris, M. L.: Dangers from Indiscriminate Use of Cathartics in Acute Intestinal Conditions, *J. A. M. A.* 44:622 (Feb. 25) 1905. Quain, E. P.: Some Observations on Catharsis, *J. A. M. A.* 59:27 (July 6) 1912.

on diminution of peristalsis; for not only is rest required for cure, but also the danger of general dissemination of the infection throughout the peritoneal cavity is lessened. Should the obstruction be due to spasm, increasing the peristaltic activity by means of cathartics merely serves to increase the spasm and the obstruction. We may, therefore, formulate this therapeutic axiom: *Violent abdominal pain unattended by diarrhea contraindicates the administration of a purge.*

What, then, the practitioner may ask, is to be done in cases of acute painful constipation? The proper treatment is outlined by M. L. Harris<sup>9</sup> as follows:

Wash out the stomach with warm physiologic salt solution or dilute soda solution and keep it empty. Then empty the lower bowel by means of enemas, so that the entire intestinal tract may be placed as nearly at rest as possible. It is unnecessary to feed these patients for a time, for they never die of starvation; but they do need water, and this should be administered subcutaneously in the form of physiologic salt solution, from 1,000 to 2,000 c.c. in the twenty-four hours. This treatment places the patient under most favorable circumstances to aid nature in bringing about a cure; and, if operation is found necessary, he is in the best possible condition for it.

#### ROUTINE USE OF CATHARTICS

The routine administration of cathartics before operation has of late been attacked, most especially by Alvarez,<sup>10</sup> on the following grounds:

1. Danger of dissemination of infection throughout the peritoneal cavity, in case localized infection exists.
2. Increased absorption of toxins and greater bacterial activity by reason of the fact that undigested

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10. Alvarez, W. C.: Is the Purgation of Patients before Operation Justifiable? Surg., Gynec. & Obst. 26: 651 (June) 1918.

food has been carried down into the colon to serve as pabulum for bacteria, and that liquid feces form a better culture medium than solid feces.

3. Increased distention of the intestine with gas and fluid, when it should empty. This is especially true when magnesium sulphate is used, as Alvarez and Taylor<sup>11</sup> have shown by experiments on rabbits. The danger of soiling the intestine is greater than with solid feces.<sup>12</sup> The small intestine is practically always empty twelve or more hours after a meal; hence an operation in the morning surely does not require purgation to clear the small intestine. The colon in which feces may stagnate can easily be cleared by enemas; and these need be given only to those who are definitely constipated, or who are to undergo an operation on the lower colon or on the pelvic organs.

4. Psychic and physical weakness produced by dehydration of the body, disturbance in the salt balance of the system, and the loss of sleep occasioned by the frequent purging during the night preceding the operation. As Oliver Wendell Holmes<sup>13</sup> says:

If it were known that a prize fighter were to have a drastic purgative administered two or three days before a contest, no one will question that it would affect the betting on his side unfavorably. If this be true for a powerful man in perfect health, how much more true must it be of the sick man battling for life.

5. Increase in postoperative distress and danger: thirst, gas pains, and even ileus. The widespread

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11. Alvarez, W. C., and Taylor, F. B.: Changes in Rhythmicity, Irritability and Tone in the Purged Intestine, *J. Pharmacol. & Exper. Therap.* **10**: 365 (Nov.) 1917.

12. Mayo, W. J.: Radical Operations for the Cure of Cancer of the Second Half of the Large Intestine, *J. A. M. A.* **67**: 1282 (Oct. 28) 1916.

13. Holmes, O. W.: *Currents and Counter Currents in Medicine*, Boston, 1861, p. 37.

postoperative use of saline infusion, in its various forms, testifies to the body's need of fluid immediately after operation. How much greater must this need be when, by means of liquid bowel movements a few hours previously, much fluid was abstracted. The weakening of some parts of the bowel, and making others more irritable, in other words, the upsetting of the gradient of intestinal muscular forces,<sup>14</sup> predisposes to flatulent distention, and gas pains. The changes described, as well as the absence of solid matter in the bowel, makes resumption of colonic activity much more difficult; and this favors the development of ileus. The purged bowel is notoriously irresponsive to further purgation, and hence, in emergency, might not respond to an appeal by cathartics, when without previous exertion it would have done so.

6. After all, however, the most important and conclusive objection is contained in the sentence used by nearly all who write against preoperative purgation. "Every surgeon has noticed that the emergency patient who comes to the hospital in need of immediate operation has as good postoperative recovery and as uneventful a convalescence as the patient who is, so-called, properly prepared. It makes little difference whether it is a case of acute appendicitis or a crushed limb requiring immediate amputation."<sup>15</sup> If this is true, and the evidence is so strong that those who believe otherwise would have to bring proof to the

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14. Alvarez (J. A. M. A. 65:388 [July 31] 1915) has shown by means of experiments on excised intestinal segments, that the intestinal contents move from the more active and more irritable regions of the intestine above to the more sluggish, less irritable regions below. This he calls the intestinal gradient. The regular uninterrupted progress of material in the bowel depends on the smoothness of this gradient.

15. Peet, M. M.: Rational Preoperative Treatment with Special Reference to Purgation, J. A. M. A. 71:175 (July 20) 1918.

contrary, then *routine* preoperative purgation must be relegated to our professional sins of the past.

Henry T. Byford<sup>16</sup> agrees, in the main, with advocating the discontinuance of routine preoperative purgation and dieting. He would, however, empty the bowel in those who are habitually constipated. Regarding postoperative purging, he believes that early purgation is required in those cases in which sufficient intraperitoneal traumatism has occurred to give rise to danger of subsequent adhesion, as peristalsis actually helps to maintain a permeable canal until the adhesions have formed and the danger of obstruction is past. When, on the other hand, there has been resection or extensive repair of the intestine, purging should not be employed until a certain amount of intestinal exudate has had time to seal up the intestinal suture line.

Regarding the futility of using cathartics in postoperative ileus, we might quote Alonzo Clark:<sup>17</sup>

When purgatives succeed, they simply show that peritonitis, if present, was not extensive enough to preclude recovery. If the intoxication is severe enough, the bowels will never move again and the patient will die, no matter what is done.

Perhaps nowhere is the routine use of cathartics more firmly entrenched than in obstetrics. The dicta, "The bowels should be opened on the second day," and "When fever occurs, the bowels should be opened immediately," form the basis of orthodox precept and practice. That this custom should be abandoned is advocated by McPherson,<sup>18</sup> who showed that routine

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16. Byford, H. T.: Purging Before and After Abdominal Section, J. A. M. A. 72: 474 (Feb. 15) 1919.

17. Clark, Alonzo: Pepper's System of Medicine, Philadelphia, 2: 1142, 1885.

18. McPherson, R.: The Routine Use of Cathartics during the Puerperium, Bull. Lying-In Hosp., New York, 11: 118 (May) 1917.

purgation after confinement is not only useless but harmful. Of 322 women who were not purged, only three had fever (and one of them had a mammary abscess); most of them had normal bowel movement; and those who did not were given an enema every third day. Of 322 women who were delivered by the same technic and the same operators but were purged in the usual routine manner, twenty-eight had some fever. He concludes that low grade fever of the puerperium may be due to catharsis, to the stirring up of colonic bacteria, and to the spreading about the mother's soft parts of loose diarrheic movements. He also finds that, when fever develops in the puerperium, purgation does not help matters much, and occasionally makes them worse. While there may be occasional need for cathartics in the puerperium, McPherson condemns their routine administration.

For the abstraction of fluid from the system, cathartics still form a part of the time-honored routine treatment of dropsy. Drink restriction, however, seems more rational than drastics for diminishing the amount of fluid in the system; furthermore, to produce an artificial diarrhea in a waterlogged patient, who is moved about in bed with much difficulty, is a veritable torture,<sup>19</sup> and quite unjustifiable in view of the poor results obtained. Thus Gee<sup>20</sup> says: "Purgatives in dropsy are not of much use. The practice is a survival. If we cannot act upon the kidney, we should do nothing to add to the patient's discomfort."

Routine detoxication by way of the bowel has almost universal endorsement in the treatment of

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19. Hirsch and Wagner, in Krause-Garré: *Lehrbuch der Therapie Innerer Krankheiten*, 2: 522.

20. Gee, S. J.: *Medical Lectures and Aphorisma*, Oxford University Press, 1908, p. 268.



uremia. Still, even here it should not be used in a thoughtless manner. Many of these patients are afflicted with vomiting and purging. In such, cathartics would obviously be contraindicated. Drastic catharsis may set up an exhausting diarrhea.

From the foregoing discussion it may seem that the day for the use of cathartics is past. This is by no means the case. A measure like this, used from time immemorial, must have some intrinsic value, and everyday medical experience has established it indisputably. One thing is certain, however, *the day for routine purgation has passed*. When mixed (like artists' colors) with brains, cathartics still form one of our most important means of diagnosis and treatment.

#### TYPES OF CONSTIPATION IN WHICH CATHARTICS ARE USEFUL

For bed patients, to antagonize the natural tendency to constipation engendered by recumbency, cathartics are probably desirable. They generally do no harm, as, with convalescence, the normal condition of the bowel returns spontaneously. When a person previously in robust health is suddenly taken with severe illness, evacuation seems to be especially indicated. The change in the patient's condition is bound to interfere with the proper digestion of the food ingested a short time previously. Here, our forefathers in medicine employed emetics as well as cathartics. We may at least feel justified in hurrying through the intestine the material, whose proper digestion has become impossible by the change in digestive functions. Cathartics, even castor oil, should be avoided in typhoid fever and in measles. In these conditions, if

evacuation is insufficient, enemas will have to suffice, as the production of diarrhea has been found to be distinctly detrimental.

We should, of course, avoid the routine use of cathartics, even in bed patients. Let us use them only when we must. The traditional use of calomel as the "initial purge" is probably unnecessary, and that of salines undesirable. When a cathartic is indicated in a bed patient it is generally because of deficiency in peristalsis, produced by lack of bodily movement. Hence, agents that stimulate peristalsis, as, for instance, cascara sagrada, should be employed rather than the salines, which are notoriously unreliable in bed patients, because they merely increase the bulk and fluidity of bowel contents without having much effect on peristalsis.

#### SYMPTOMATIC CONSTIPATION

There are patients suffering from symptomatic constipation rather than from the essential form, such as those with minor degrees of chronic intestinal obstruction, and those whose bowels do not functionate properly because of chronic appendical or gallbladder disease,<sup>21</sup> who can keep themselves comfortable for an indefinite time by more or less habitual use of cathartics. In such patients the constipation usually begins later in life. They generally suffer from abdominal discomfort, frequently pain, and at times from violent attacks of indigestion. They occasionally have diarrhea alternating with constipation. We must also add to this category sufferers from carcinoma of the bowel, as well as those afflicted with inflamed hemorrhoids

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21. These may produce constipation by causing stenosis, or else by upsetting the intestinal "gradient" (Alvarez), a lower portion of the intestine having become more irritable than the portion above it.

or other painful anorectal diseases. Of course, in all of these, etiotropic therapy should be resorted to whenever possible, and surgery or massage may in appropriate cases rescue the sufferer from becoming a slave to the purge. Yet there are many who will not resort to radical treatment, or cannot have it, who can, by submitting to such enslavement, make themselves comfortable. Among those who cannot have radical treatment must be classed cases too obscure to enable one to advocate operative measures. With many a physician it is a rule of practice to prescribe to patients suffering from a chronic tendency to abdominal pain a course of laxative treatment. This procedure is not only of therapeutic but also of diagnostic value. The most useful drugs for this class of cases are either salines or oils. For painful anorectal conditions, sulphur probably also deserves consideration. We can very well understand how the liquid, or very soft bowel contents, resulting from the administration of these agents, may slip by or through a narrowing, or an adherent or otherwise disabled portion of the intestine, with less difficulty than more consistent matter would. This lessens the violence of peristalsis required from the proximal segment of the bowel, and, with it, colic or other distresses resulting therefrom. It may also be that we reestablish a disturbed intestinal gradient by increasing the irritability of the bowel above an abnormally irritable segment. As various cathartics have special action on certain intestinal segments, for example, podophyllum on the duodenum and aloe on the colon, we can understand why, with certain patients, one cathartic, and with other patients another one, acts best. More detailed knowledge of these specific effects of purgatives on special portions

of the intestine is desirable, especially as we now can localize, by means of roentgen rays, the seat of disturbance in the patient's intestine. Had we this knowledge we could predict with scientific precision which cathartic will act better in a certain patient.

The constipation of those crippled by age, incurable infirmity, or chronic systemic disease, such as kidney, liver, heart or lung affections, likewise requires habitual catharsis. The constipation, generally produced in these cases by the abnormal mode of living forced on them by their disease or debility, is liable to aggravate the underlying disturbance, thereby resulting in a vicious circle, which may be broken in on and prevented by maintaining sufficient evacuation of the bowel.

Sufferers from a weak or diseased intestine, or a weak constitution, who need habitual catharsis—just as a person with weak ciliary muscles needs eyeglasses, or a person with a weak leg needs a crutch—should have such cathartic prescribed for them with at least as much care to fit them properly as is taken in refracting a patient's eye. For habitual use, whenever possible, pill form should be preferred because of its convenience. This form of administration is, of course, impossible for those who need oils or salines; but for those who do not require softening of the stools the purgative pill must be considered ideal. The study of the best composition of such pills will be taken up later. One thing may, however, be emphasized here, namely, that a habitual pill generally needs not to be given daily. In the interest of economy, not only financial but functional as well, we should lay down the rule that the dose be taken only in the evening of those days on which no bowel movement

occurred. This secures a bowel movement at least every second day, which is commonly sufficient, and saves many a dose of drug.

#### HABITUAL CONSTIPATION

In the cure of habitual constipation, cathartics, if properly used, are of help. While some, who do not accept patients unwilling to submit to a regular course of treatment covering a period of from six to seven weeks, may well say that they have not used medicines in the curative treatment of constipation for many years, and that the results obtained from the non-medicinal plan—which includes diet, mechanotherapy, hydrotherapy and electrotherapy—have been vastly superior to those accomplished by drugs, yet many patients are unable or unwilling to undertake such prolonged courses of treatment. The knowledge that descending dosage of cathartics, accompanied by appropriate regulation of hygiene, will often cure habitual constipation without recourse to physical therapy, is of practical importance. For this purpose *cascara sagrada* is the remedy *par excellence*. The treatment amounts to a gradual weaning of the patient from the cathartic habit, as contrasted with the sudden breaking in on this habit by the acathartic method. Cases that resist the gradual dose reduction might still be cured by recourse to physical therapy, which should be offered as soon as it becomes evident that the simpler method failed, but not before. To speak of this to the patient earlier would be a tactical error, as it would undermine much of the patient's confidence in the treatment, and with this its psychotherapeutic value. It must be admitted that there are cases in which all these methods fail. This intractable form must be treated along the line previously mapped out for constipation of the disabled individual.

## CATHARTICS IN "INTESTINAL TOXEMIA"

That cathartics must be of value to promote the elimination of disease-producing poisons from the intestine is self-evident. No one disputes this proposition. The dispute arises over the question: When does the intestine harbor such poisons? The intestinal tract is endowed with wonderful safeguards against intoxication, not the least among which is the inspissation of the intestinal contents and the formation of scybala from which absorption practically does not occur. Indeed, to whatever extent cathartics interfere with the formation of scybala they contribute to intestinal toxemia, not only because absorption from liquid or semiliquid contents is much more active than from solid material, but also because such contents form better culture mediums for bacteria, partly by reason of their fluidity and partly by reason of the fact that they are richer in nutritive material for bacteria. The doctrine of Adolf Schmidt,<sup>22</sup> "No diarrhea with increased peristalsis without secretion of a decomposable fluid by the intestinal membrane," applies to diarrhea produced with therapeutic intent as well as to diarrhea occurring from other causes. It is a well known clinical fact that intoxication phenomena are much more prominent in diarrhea than in constipation, and that there are people who feel weak and miserable, as though poisoned, for a few days after purgation. Of course, this increase in autointoxication may be merely temporary, to be followed by improvement, for, as Herschell and Abrahams<sup>23</sup> say, both castor oil and saline purgatives greatly increase autointoxi-

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22. Schmidt, Adolf, quoted by Aaron, C. D.: *Diseases of the Digestive Organs*, Philadelphia, Lea & Febiger, 1918, p. 238.

23. Herschell, G., and Abrahams, A.: *Chronic Colitis*, New York, Longmans, Green Co., 1914.

cation for some hours, the excretion of ethereal sulphates rising very considerably. It then commences to fall until it is reduced much below normal. The explanation is, of course, that the purgative stirs up the intestinal contents, and the poisons are absorbed into the circulation.

The theory that toxic intestinal contents are responsible for disease has been so abused as a "cloak for ignorance" that the terms "biliousness" and "auto-intoxication" are practically tabu in strict scientific discussion. "Biliousness," which once was considered a well established disease entity, the successful treatment of which, by the use of "chologogues," was one of the cherished dogmas of medicine, has become so unpopular of late that one searches in vain for even the word "biliousness" in the index of modern books on gastro-enterology or on the practice of medicine. Adami<sup>24</sup> concludes that the term "gastro-intestinal auto-intoxication" is pernicious, and not to be employed by any self-respecting member of the medical profession, save for so limited a set of conditions that for ordinary purposes it may safely be expunged from the medical vocabulary. Still, it remains a clinical fact, abundantly substantiated, that a very large number of symptoms have been relieved by catharsis. With many a physician it is a rule of practice when in doubt to "open the bowels." Alvarez,<sup>25</sup> who rejects the doctrine of the chemical causation of these symptoms, admits that symptoms such as mental haziness or "dopiness," malaise, headache, spots before the eyes, coated tongue, and poor appetite, are often instantly

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24. Adami, J. G.: Chronic Intestinal Stasis, *Brit. M. J.* **1**:183 (Jan. 24) 1914.

25. Alvarez, W. C.: Origin of the So-Called Auto-intoxication Symptoms, *J. A. M. A.* **72**:8 (Jan. 4) 1919.

relieved by a bowel movement. He explains these symptoms as due to the effect of afferent nerve impulses, coming from a distended overactive or wrongly acting bowel, on a particularly sensitive nervous system. According to him, also, ripples of reverse peristalsis carry more than the usual amount of bile back into the stomach and up into the mouth, depositing gastric and perhaps intestinal contents on the back of the tongue, and giving rise in this way to the coat on that organ—sometimes even bile-stained—the bad taste and the bad breath. He believes that the relief obtained by taking calomel is not due to any action on the liver, but to a restoration of the normal downward currents in the intestine. Be that as it may, we must conclude that cathartics do frequently relieve symptoms due to abnormal conditions within the bowel, and that they must therefore be looked on as an important diagnostic aid in our hands. Of course, the proper curative treatment of the symptoms due to chronic intestinal stasis is that of the accompanying constipation, and this requires differentiation of type and etiotropic treatment, rather than chronic catharsis.

#### CATHARTICS IN DIARRHEA

In the treatment of diarrhea, cathartics play, at most, a minor rôle. Of course, they might “assist nature” in certain cases, especially of stercoral diarrhea, that is, diarrhea due to retained fecal masses, and in the fermentative form. On the other hand, in gastro-genic and in nervous diarrhea they are useless and may be harmful. Before using cathartics in diarrhea we should, therefore, ask ourselves, first, whether the cause is located in the intestine; and, secondly, whether



nature requires our assistance. Hill's<sup>26</sup> common sense statement regarding purgation in infantile diarrhea also has decided bearing on the treatment of diarrhea in the adult:

It is a mistake to give a purge as a routine in every diarrheal disease. If there is any harmful material in the intestine which is not coming out as fast as it should, a purge ought to be given; otherwise not. It is not rational to purge a baby which is already having a good many loose stools a day, and whose intestine is emptying itself of toxic material as fast as it possibly can. In such cases, castor oil or calomel adds insult to injury. On the other hand, a baby who is seen at the onset, who has fever, and who has not yet been emptied by diarrhea, ought to be purged at once; and it is often striking to see how the temperature will drop and how much more comfortable the baby will be after a good cleaning-out.

#### CONCLUSIONS

1. With the average adult, a daily bowel movement is not a necessity for a state of health.

2. Cathartics are habit-producing drugs, admissible only in case of temporary disturbance due to harmful material in the intestine, and in those suffering from an intestine disabled by local or general disease or debility, who in default of curative measures may have to be provided with a habitual evacuant. Especially obnoxious is the habitual use of purgatives in childhood.

3. Mild laxatives and enemas should replace the more drastic drugs. The mildest is the best, and the patient should be carefully fitted with the cathartic he needs.

4. Acute abdominal pain, unless accompanied by diarrhea, contraindicates catharsis. On the other

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26. Hill, L. W.: The Etiology and Treatment of the Diarrheal Diseases of Infancy, J. A. M. A. 72: 1653 (June 7) 1919.

hand, some patients with a chronic tendency to abdominal pain may keep themselves comfortable by suitable catharsis.

5. Cathartics are useful as a means of diagnosis for the determination of the degree to which symptoms are due to disturbance within the intestine.

6. Routine purgation, be it preoperative, postoperative or postpartum, be it employed in the treatment of diarrhea, apoplexy, dropsy or uremia, is undesirable.

## CHAPTER II

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### LIQUID PETROLATUM AS A LAXATIVE

The rapidity with which "mineral oil," one of the more recent additions to our materia medica, has conquered the globe has been phenomenal. It is now a most extensively used medicinal substance; and, if its sale were a real indication of its medicinal value, we should have to consider it one of the most valuable of medicaments. While not ready to grant this preeminence, we may at least view its popularity without alarm; for, of all substances with which mankind has belabored its system, petrolatum is surely the most inert and perhaps the most harmless.

Petrolatum is a bland, odorless, tasteless and colorless liquid, indigestible, as well as incapable of decomposition by bacteria; hence it cannot become rancid. It is not absorbed; therefore it cannot produce poisoning in any dose. A pint of liquid petrolatum has been given in a few hours without untoward results.

Owing to its innocuousness, this substance should be the laxative of first consideration. While it is merely of temporary value in habitual chronic constipation and possibly may still further increase the intestinal sluggishness by lessening the amount of work—of exercise—of the intestinal and abdominal muscles, it seems to have an actual curative effect in certain conditions, as, for instance, in spastic constipation, in which, by lessening the irritation, it may ultimately succeed in lessening the irritability.

Liquid petrolatum is indicated whenever it is desired to soften the feces. The oil, being indigestible, remains in the feces in the form of globules. To speak of this action as "lubrication," as is often done, is hardly

correct. Lubrication depends on the formation of an oil film, and such a one it is impossible to apply to a water-soaked membrane like the intestinal mucosa, or to the ordinary moist fecal mass. When an excess of oil has been ingested it does not apply itself as a film to the surface, but remains separate from it, giving rise to the much complained of "leak" of oil through the anus, which may occur even with small doses.

As liquid petrolatum does not give rise to irritant products such as the fatty acids liberated by the digestion of fatty oils, especially of castor oil, it may be given with safety for irritation of the gastro-intestinal tract. By its softening effect on the stools it may even have a healing action on superficial lesions of the mucosa.

In intestinal stasis due to crippling of the intestine, be this from kinks or other forms of obstruction, or even malignant tumor, its softening effect on the feces is likely to prove valuable.

The dose varies from 15 to 90 c.c. When larger dosage is employed, there is likelihood of leakage of the oil. Sometimes free oil is passed in a bowel movement, or even without one. It was supposed that the "heavy" liquid petrolatum, by reason of its greater viscosity, would be less likely to give rise to leakage. That this is not the case was shown by a collective investigation carried on by Bastedo,<sup>27</sup> under the auspices of the Committee on Therapeutic Research of the Council on Pharmacy and Chemistry. To ascertain whether any difference existed in the efficacy of the different varieties of liquid petrolatum, clinicians were furnished with specimens of light Russian liquid

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27. Bastedo, W. A.: Clinical Experience with Liquid Paraffin (Liquid Petrolatum), J. A. M. A. 64: 808 (March 6) 1915.

petrolatum, heavy Russian liquid petrolatum, and an American brand of light liquid petrolatum. To avoid bias, the specimens were designated by numbers or letters. The conclusion of this study was that the differences were too slight to be of importance. There was no difference in the dose required, in effect on stomach or stools, or in their tendency to give rise to leakage.

As a general proposition, when leakage occurs, it is an indication that the dose should be reduced. If such reduced dose is insufficient to act on the bowels, it may be reinforced by a specific stimulant to peristalsis, such as cascara sagrada. The oil seems to be devoid of any effect on the intestinal musculature except that it diminishes the work of the muscle by softening the feces. In cases in which synergistic use of cascara is contraindicated, as for example in spastic constipation, it might be well to try a petrolatum of higher melting point, like petrolatum, U. S. P., which it is reasonable to assume might be less likely to produce this undesirable effect.

Emulsification is another expedient that it seems ought to be capable of overcoming the tendency to leakage. The National Formulary contains the following formula:

EMULSUM PETROLATI, N. F.

	Gm. or C.c.
Petrolatum .....	22.5
Expressed oil of almond.....	22.5
Acacia .....	12.5
Syrup .....	10.0
Tincture of lemon peel.....	1.5
Water, to make .....	100.0

Average dose: one tablespoonful.

This preparation would be worth trying in such cases; and reports on its success or failure in meeting

the requirements of activity, pleasantness, and absence of tendency to "leak" would be of interest.

Our choice among the different brands of petrolatum should be chiefly determined by palatability. This depends on the degree to which the refinement of the oil is carried out.<sup>28</sup>

Fancy named products should be avoided. Not only are such products more expensive, but when any one of these half hundred brands is prescribed, the druggist, who may have half a dozen other brands that are just as good on his shelves, will have to buy a full bottle of the product specified and charge the patient the price of the whole bottle, even though the prescription calls for but part of it—the rest, probably, remaining on his shelf indefinitely. Such specifying is an injustice to the druggist and to the patient. Why not trust pharmacopeal quality? If the druggist does not dispense U. S. P. quality, he can be legally prosecuted. Of course, if U. S. P. quality is not good enough, specifying may be necessary until the quality of the official product has been improved. The official quality of heavy liquid petrolatum (petrolatum liquidum grave) is satisfactory. If, however, one desired an extra fine product, and higher price is no

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28. In 1914, THE JOURNAL (May 30, p. 1740) published the following list of names under which liquid petrolatum was then known: adepsine oil, amilee, atoleine, atolin, blandine, crysmalin, decline, glyco, glycoline, glymol, heavy petroleum oil, liquid albolene, liquid cosmoline, liquid fessiline, liquid geoline, liquid paraffin, liquid petrolatum, liquid saxoline, liquid vaseline, mineral glycerin, mineral oil, neutralol, olo, paraffin oil, paroline, petralol, petro, petrolax, petrolia, petronol, petrosio, rock oil, Russian liquid petrolatum, Russian mineral oil, Russian paraffin oil, Russol, saxol, terraline, terralbolia, usoline, water-white mineral oil, and white paraffin oil. To this list many more names, such as "nujol" and "purpetrol," would have to be added to bring it up to date. Here is a good illustration of the inexpediency of employing coined and copyrighted names in prescribing standard official products. S. L. Hilton (Petrolatum Liquidum, U. S. P. VIII, J. Am. Pharmaceut. A. 3:577, 1914) quoting the wholesale prices of various brands of liquid petrolatum, found that those with fancy coined names commanded a very much higher price than other oils on the open market—all, or nearly all, coming from the same source. Of course, manufacturers and dealers would not coin names if they did not expect to coin something substantial out of them.

object, one might specify the name of a distributor who promotes a possibly somewhat superior product in an ethical manner, for instance, Squibb, to mention one such.

As the oil is tasteless and odorless, it is probably best taken in its pure state. It may be floated in some pleasantly flavored fluid, such as orange juice or grape juice. Flavoring by means of a pleasant volatile oil may be resorted to, should the patient prefer a distinctive flavor to the insipidness of the liquid petrolatum. Hilton has experimented on this matter, and found that per 500 c.c. of oil, these quantities of one or the other flavoring oils are suitable: anethol, 10 drops; oil of almond, 15; oil of cloves, 10; oil of cinnamon, 5; oil of peppermint, 15; oil of spearmint, 15, and methyl salicylate (wintergreen), 25 drops. To him, peppermint seemed the most pleasant flavor, with cardamom a close second. We must recognize the fact, however, that there are people who abhor one flavor, such as peppermint, enjoyed by another; and that any one is liable to tire of a decided flavor used frequently. Combinations of flavors—bouquets—are often more acceptable than single flavors, and enjoyed for a longer time. Thus the oil combination used in the flavoring of aromatic elixir might be used to make liquid petrolatum aromatic: oil of orange, 2.00; oil of lemon, 0.50; oil of coriander, 0.20; oil of anise, 0.05; liquid petrolatum, 1,000.

As the oil, when taken after meals, is likely to lie heavily on the stomach and produce other gastric distress—in Bastedo's investigation 20 per cent. complained of nausea or tendency to repeat—it is best to take it in such a way that it will interfere least with gastric digestion. This is secured by giving a dose,

from 15 to 60 c.c. of it, at bed time, or else administering 15 c.c. one hour before each meal.

Patients given this laxative for the first time should understand that it does not produce an immediate effect, but that it may have to be taken for several days before results will be noted. When the desired effect is not obtained with the initial dose, the quantity should be increased until the stools have been sufficiently softened. The efficient dose is then to be maintained for a while—several weeks, perhaps—and then gradually reduced until regularity of bowel action has been secured or the minimal dose has been ascertained that is required for satisfactory function. It must be remembered that if kept up for some time a habit may be formed. While it may not be a serious one so far as concerns harm to the system, it is an expense to the individual and especially a nuisance.



## CHAPTER III

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### OLIVE OIL AS A LAXATIVE

Olive oil, cottonseed oil and other food oils and fats can do all that liquid petrolatum can do—and one thing more: they can nourish the body.

That digestible oils may act as laxatives, it is necessary to give more than can be digested and absorbed. This, in the case of an infant, may be one or more teaspoonfuls daily. To obtain laxative effects from olive oil in an infant, it is well to commence with one-quarter teaspoonful once or twice a day after feeding, and to add one dose a day until a dose is given after each feeding. It may then be increased to half a teaspoonful at a dose, if required and if it is well borne. It is inadvisable, however, to use more than 10 or 15 c.c. in a day in case of a young infant; even less than this would be the limit, if the character of the stools becomes abnormal.

The adult must take considerably more of digestible oil than of petrolatum to obtain the same laxative action. The exact dose will differ, of course, chiefly with the amount of other fat ingested and with the digestive capacity of the individual. One or two tablespoonfuls may have to be given three times daily either an hour before meals, or, if this interferes with appetite, two hours after meals. Or else, if the patient prefers it, a single dose of from one-half to one wineglassful may be administered on rising, or two hours after breakfast. If this dosage is insufficient, it must be increased, until the desired effect is produced or the limit of tolerance is reached.

When digestible oil is thus administered until laxative action follows, the physician makes certain that the

patient is kept at the highest point of fat digestion and assimilation possible for him. Hence, in view of the high caloric value of fat, gain in weight may be expected, unless the patient's previous use of fat was up to the limit of his digestive capacity, or unless the increased fat ingestion impairs appetite or digestion.

#### CONTRAINDICATIONS

In view of the fattening quality of olive oil thus used, it is obviously contraindicated in obesity, while it is especially indicated in malnutrition. In other words, in an obese person, liquid petrolatum would be the superior laxative; in an emaciated individual, digestible oil ought to be preferred.

In further drawing special indications and contraindications for the laxative use of oil, we should take cognizance of its action on gastric secretion and movement. That oil decidedly lessens the amount of free as well as of total acid, and that it delays the emptying of the stomach, is the verdict of all authorities on this subject. That the diminution in acidity of gastric juice also occurs in conditions of pathologic excess has been shown as well. Hence, while hyperchlorhydria, pylorospasm and peptic ulcer furnish special indications for the use of olive oil, gastric atony or subacidity would contraindicate the prolonged medicinal use of this or of other oils, including liquid petrolatum.

#### METHOD OF TAKING OLIVE OIL

In the administration of large quantities of oil, such as are contemplated for therapeutic effect, the natural repugnance of many persons against the drinking of fat must be reckoned with. While considerable quantities of oil may be taken with relish in the form of mayonnaise or of French salad dressing, still the

amount that can be introduced in cookery is limited. The method advocated by Rutherford<sup>29</sup> is of interest. He advises mixing cold olive oil with about an equal quantity of hot milk. As these are of about the same specific gravity, they will mix perfectly in the form of an emulsion and remain in this condition for a short time (half a minute). Those who dislike milk might prefer to take the oil floating in fruit juice, such as lemon, orange or grape juice. In course of time, people almost without exception acquire a taste for oil, and then take it with relish in any reasonable amount. There is reason to believe that the capacity for taking care of fats may be increased by gradual increase in the amount ingested. It is well, therefore, to commence with small amounts, and to have the patient increase the dose as tolerance is developed.

With some persons the taking of considerable amounts of fat leads to attacks of indigestion, with coated tongue, offensive breath, loss of appetite, abdominal distress and unusually offensive stools as the most prominent symptoms: the condition known as "biliousness." In such, of course, the use of olive oil as a laxative would be ill advised. Whether liquid petrolatum is better borne by such individuals is not known at present.

#### OLIVE OIL NOT ADVISABLE IN DIABETES

It is now fairly well established that in a person suffering from diabetes, the digestion of excess of fat carries with it the danger of acidosis, owing to incomplete combustion of fatty acids in this condition. Liquid petrolatum should, therefore, be used as an oil laxative in a diabetic, even though the patient's emaciation would make the use of olive oil seem desirable.

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29. Rutherford, H. H.: Pure Olive Oil and Its Use in the Treatment of Chronic Dysentery and Allied Conditions, *Am. Med.* 7: 432, 1904.

## SUMMARY

To summarize: Olive oil might be particularly serviceable as a laxative in spastic constipation in an emaciated individual, provided a sufficient quantity to produce this effect can be ingested without causing loss of appetite or other digestive disturbance. The use of olive oil as a laxative would be contraindicated in obesity, in diabetes, in gastric atony and in hypochlorhydria, as well as in those inclined to "biliousness."

## CHAPTER IV

### THE OIL ENEMA

While the oral administration of oil is conditioned on the absence of certain contraindications, its rectal injection is almost free from these; and, provided it can be retained, a much more direct method of softening the feces and favoring their evacuation than having it pass all the way through mouth, stomach and small intestine. For, it must be remembered, the contents of the cecum and ascending colon are liquid; if we can get the oil to these parts, which can be done by proper technic, it will keep the feces soft because it cannot be absorbed. Furthermore, the softening of the feces is also due to interference with the absorption of water, probably in a purely physical manner, the oil preventing diffusion of water into the mucosa. Lipowski<sup>30</sup> considers this effect of the oil enema of special significance, as he believes that a common form of constipation is due to excessive absorption of fluid from the colon, which results in abnormally hard fecal masses. According to him, the excessive fluid resorption is due to congestion of the colonic mucosa, which in turn is maintained by irritation from the resulting hard fecal masses. He bases his contention on abnormal redness of the mucous membrane, shown by these cases on sigmoidoscopic examination, and on the demonstration that, in such patients, a larger proportion of a physiologic salt enema is absorbed than in the normal. The oil enema breaks in on this vicious circle by keeping the feces soft, and soothing the mucosa.

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30. Lipowski, I.: Eine neue Grundlage zur Beurteilung und Behandlung der chronischen Obstipation, *Berl. klin. Wchnschr.* **46**:1359 (July 19) 1909; Die Behandlung der chronischen Obstipation durch Paraffineinläufe, *München. med. Wchnschr.* **57**:2635 (Dec. 13) 1910.

This keeping of the feces soft by the oil enema must not be confused with the dissolving of hard fecal masses. Hertz <sup>31</sup> has shown that oil is a great deal less effective than water in breaking down hard scybala. He found, by actual tests, that water produced a greater softening effect on hard feces in fifteen minutes than could be achieved by oil in twelve hours. The only manner in which oil enemas are of use in dealing with hard scybala is to facilitate their expulsion by lubrication.

It is easy to understand, therefore, why, after the first oil enema, patients usually pass hard fecal masses, together with soft, mushy material and some of the oil. It is to be noted that some of the injected oil is retained, exerting its effect on the bowel movement of the next day, and even of succeeding days. Fleiner speaks of oils having been found in evacuations as long as a week after discontinuance of its injection. When a daily injection is employed, scybala presently disappear, and soft, mushy stools are passed. This Fleiner considers an indication that the maximum effect has been obtained, and that the quantity and frequency of the oil injections may be reduced.

The evacuant action of injections of petrolatum, liquid or soft, is entirely due to the physical effects just described. The saponifiable oils have a chemical action, in addition, which is due to decomposition of the oil by lipase present in the colon. In this manner, some of the oil is changed to glycerin and fatty acids, a portion of the latter combining with bases to form soaps. All of these products are irritant; and, to the effect of these, a large part of the evacuant action of such enemas must be ascribed. The feces passed con-

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31. Hertz. A. F.: Constipation and Allied Intestinal Disorders, New York, Oxford University Press, 1909, p. 293.

tain more free fatty acid than the oil did that was introduced, and the fecal odor becomes more offensive by admixture of the odor of rancid oil. Indeed, this decomposition and the irritation resulting therefrom may become excessive, leading to peristaltic unrest, even colic or rectal tenesmus. To minimize the occurrence of such disturbances, it is of greater importance that the oil be pure and free from rancidity (of an acidity not exceeding 40 to 55 [Fleiner]), than that it come from a certain source. Thus poppy-seed oil, oil of sesame, or cottonseed oil, when pure, are just as good for this purpose as olive oil. It would seem that petrolatum would be preferable to all of these, as it can never become irritant.

Lipowski advocates the injection of petrolatum of a melting point of 38 C., that is, slightly above rectal temperature (37.5 C.). He claims not only absence of irritation and of offensive products of oil decomposition in favor of such enemas, but also lack of liability of leakage from the anus, which is at times most annoying when liquid oil is used. He also asserts that petrolatum enemas are less expensive.

The proper melting point is of importance in connection with Lipowski's petrolatum injections, for the material is introduced in melted condition and is intended to congeal to a salve after it has spread itself over the rectal mucosa. This consistency is obtained by melting together paraffin of a melting point of 78 C. with liquid petrolatum in the proportion of 1:8. The difference between administration of these petrolatum injections and of those of other oil lies in the somewhat higher temperature at which the material is injected and the necessity of having the injecting apparatus warm, so as to avoid congealing within it.

To make certain that the injection is not too hot, the patient might dip his finger in the fluid. A colon tube and funnel suffice for the self-administration of these enemas, as the patient need not lie down during or after the injection. The patient might, after having passed the colon tube, seat himself at the edge of a chair and, bringing the tube up between his thighs, conveniently pour the melted petrolatum into the funnel. The quantity injected does not need to be more than 200 c.c. to obtain satisfactory results, as a rule. It would seem that enemas thus given might suffice and be preferred for the treatment of affections of the rectum and pelvic colon; while, for affections higher up in the colon, the technic presently to be described should be employed.

The indications for oil enemas might be thus summarized:

1. To soften feces, in constipation characterized by formation of hard scybala and that due to partial obstruction of the colon.

2. For evacuant action, in so-called "spastic" constipation, in pelvirectal constipation, and in any other form of constipation in which oral administration of cathartics is contraindicated by gastric disturbance.

3. For soothing action, in excessive colonic and rectal irritability. Herschell and Abrahams<sup>32</sup> consider oil enemas, next to appropriate diet, the single most important method of treatment in colitis. They are also useful in proctitis.

4. It has been suggested that oil enemas might inhibit the absorption of toxic products. That the oil has the power of removing substances soluble in it is shown by the fact that it is passed dark yellow or olive green

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32. Herschell, G., and Abrahams, A.: *Chronic Colitis*, London, Longmans, Green & Co., 1914.



and of offensive odor. We have no definite knowledge, however, of the degree to which this property might be of clinical value.

The chief contraindication to oil enemas is diarrhea, mainly because, in this condition, the oil would not be retained for a sufficient length of time to be of use; although another objection against the introduction of saponifiable oils would be the possibility that excessive peristalsis might carry unusual amounts of intestinal juices far down the colon, the results of the excessive oil digestion being liable still further to increase the irritation.

*Technic.*—For self administration, the patient should have everything prepared before going to bed, so that he does not have to get up after having taken the injection. The bottle of oil is placed in a basin of hot water until it has acquired blood heat (100 F.). An ordinary fountain syringe might be used, provided the nozzle has a sufficiently large bore to permit the oil to pass readily. Though it is intended that the oil shall be introduced slowly, the bag usually has to be hung from 2 to 3 feet high owing to the viscosity of the oil, which makes it run rather slowly. The clip should be placed within easy reach of the patient. Having poured the warmed oil into the bag, the patient lies on the left side with a folded towel and a firm pillow underneath the buttocks. The nozzle is inserted into the anus, and the oil permitted to flow. Should the patient experience distress or desire to move the bowel, the flow of the oil is checked and the patient remains quiet until the desire has passed. It might then be possible to introduce an additional quantity of oil. It is usually best, however, to be satisfied with the introduction of an amount that can easily be retained. After a while

the patient turns on the back and finally on his right side, in which position it is recommended he should remain over night. A piece of absorbent cotton or a woman's sanitary towel or both may be applied to prevent accidental soiling of the bed, for the passage of flatus may be accompanied by a spurt of oil.

If the injection produces discomfort and interferes with sleep, it may be taken early in the morning and the patient might lie in bed for three or four hours afterward. It should be understood that, unless the oil remains in the intestine for several hours at least, satisfactory results cannot be expected.

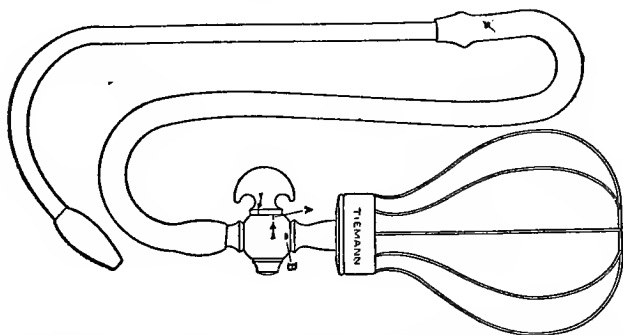
The total quantity to be injected depends on the patient's ability to retain it. This is so variable that no definite figure can be stated for any one person. The principle to be followed is to have the patient gradually increase the amount injected on successive nights, until a satisfactory amount can be introduced and retained. The patient may not be able to retain more than 70 c.c. at first, but is likely to be able to take, in course of time, as much as 250 and even 500 c.c. When satisfactory results have been attained, the quantity introduced as well as the frequency of injections is gradually diminished. The injections may then be given on alternate nights, unless resumption of daily administration is necessitated by the patient's condition. Later on, enemas are given every third night, and finally only on the evening of the day on which the bowels were not opened. A single injection may cause daily evacuations for several days.

For children, the quantity injected may range from 50 to 150 c.c. For infants, 15 c.c. may suffice.

When the injection acts well, it is followed by a very soft stool in the morning. If the morning evacuation is not obtained, an enema of physiologic sodium chlorid solution should be taken after breakfast.

In bed patients, administration in the morning would be preferable. When an attendant gives the injection, a colon tube and funnel is all the apparatus required.

In spite of its excellent theoretical foundation and the enthusiastic recommendation of numerous clinicians, this treatment is not very popular, probably because of the troublesomeness of the procedure, the annoyance, and the expense. An enemator was described by Dudley Roberts,<sup>33</sup> by the use of which the procedure may be simplified.



The enemator consists in a curved rectal tube of hard rubber, the end of which is olivary shaped to make it self-retaining. This tube is made curved so that it comes up in front of the pubis; to this end is attached a 10-ounce Politzer bag, the connecting soft rubber tube being of a convenient length for the patient. The rectal tube is made with such a curve that it is readily passed from the front of the body to the anal opening; here by a slight traction movement it enters the anus in the proper direction, pointing toward the umbilicus. It has been demonstrated that this new form of tube is much less awkwardly introduced than by reaching around behind the buttocks. The Politzer bag is fitted with a stopcock having a small hole in one side, which permits the bag to fill with air when the cock is closed. The method of taking the injection is simple; the bag is allowed to fill itself, and is then placed in warm water to warm the oil. The patient lies on the back with the hips somewhat elevated and introduces the rectal tube with soft rubber tubing attached. The bag is then attached and the stopcock turned to permit the oil to be forced slowly into the rectum. The bag being emptied, the stopcock is turned and air dilates it so that all oil may be forced from the tubing; by shutting off the stopcock we prevent the return of any oil into the tube and obviate the danger of soiling the clothing and bedding.

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33. Roberts, Dudley: A New Rectal Enemator, *J. A. M. A.* 47:273 (July 28) 1906.

## CHAPTER V

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### CASTOR OIL

The "soothing purgative"\* is probably the best sobriquet by which to characterize the therapeutic qualities of this old reliable agent of notoriously nasty taste. Were it not for this unique combination of action it would probably have long ago been consigned to the limbo of the abandoned scourges of the ill. It is the fact that it is the least irritant of the powerful and reliable cathartics, the most potent of the evacuant oils, that renders it still indispensable.

To be a reliable purgative, a substance must produce a certain degree of irritation in the intestine, hence the term "soothing purge" may appear paradoxical. As is well known, this oil, bland and soothing in itself, yields an irritant—ricinoleic acid—on digestion in the intestine. Accumulation of this irritant, with possibility of excess of irritation, does not occur, partly because of the powerful peristalsis it provokes, which pushes it on and on, so that the small intestine empties itself into the colon in two hours instead of the normal eight, but chiefly on account of the fact that this unsaturated fatty acid is absorbed and assimilated, and capable of serving as food for man. Castor oil, be it remembered, is an article of diet in China, which goes to prove the saying, "*De gustibus non est disputandum.*" Demulcent up to the moment of its

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\* We must differentiate between a purgative and a laxative. A laxative is an agent that produces formed stools, and is incapable of causing active purgation in any dose. The oils previously discussed are typical laxatives. A purgative is an agent capable of causing profuse evacuation of the bowels, but which does not act as an irritant poison in any dose. Castor oil belongs to this class of cathartics. A drastic is an active cathartic which in overdoses acts as an irritant poison.

digestion, the portion that is split up becomes momentarily irritant, to be reconverted into the soothing triglycerid of ricinoleic acid—or castor oil—on absorption through the intestinal mucosa.

From this it is easy to understand that the action of castor oil is, to a certain extent, independent of dose, and that the dose is not much influenced by age. An infant may safely be given a teaspoonful or two—a dose that will usually physic an adult. The reason is that castor oil becomes activated in proportion to the amount of digestive juices available; and, of course, the larger the intestine the more juice there is. The quantity of oil that exceeds the digestive capacity is passed through unchanged, acting merely like so much petrolatum. Excessive action is therefore an impossibility. True, the usual dose for an adult is from 1 to 2 tablespoonfuls, and it must be admitted that such a dose is more reliable and thoroughly active than that of a teaspoonful or two. When, however, there is difficulty in administration, on account of the taste, the knowledge that a teaspoonful may suffice for an adult is of importance.

Because of the thoroughness and reliability of its action, and the impossibility of excessive effect, it is the purgative of choice for delicate invalids, infants, in pregnancy, and in patients with hemorrhoids or anal fissure.

For the reasons given, castor oil produces little griping; indeed, it is a good remedy in the treatment of intestinal colic. "The castor oil cure"—a course of daily doses of castor oil—has relieved many an obscure case of abdominal pain, and incidentally made the diagnosis.

In cases of abdominal pain in which an intestinal obstruction is suspected, castor oil is probably the

least objectionable of the reliable cathartics. Here, too, it has diagnostic importance: for, if a liberal dose fails to act, more drastic cathartics will probably also fail, and ought not to be employed.

This oil is notorious for its tendency to leave the bowel sluggish after it has produced an evacuation; hence it is one of the worst drugs to give in the treatment of chronic constipation. On the other hand, in view of its soothing qualities, it is a cathartic to use during the cleaning-out phase of the treatment of acute diarrhea. Regarding its use in chronic diarrhea, Brunton writes: "Sometimes a teaspoonful of castor oil, given every morning, will do more for a chronic diarrhea than anything else I know."

I. A. Abt found, however, that even castor oil is not absolutely harmless, at least in children, as he discovered evidences of irritation in the last stools when teaspoonful doses were given on three successive nights. Single dram doses produced no irritation; and, as compared with magnesium sulphate and calomel, it seemed to have the least irritant action.

A dose of castor oil usually acts in from four to six hours; hence it should be given so that it will produce its effect while the patient is awake. Like other oils, it has a tendency to delay gastric evacuation, and therefore it is best given on an empty stomach an hour before breakfast.

It is possible to so refine this oil, that, provided it is protected from the influence of the air, it is almost devoid of odor and taste. Such oil is obtainable under the trade name of Kellogg's "Tasteless." Squibb's, or Allen & Hanbury's, are very similar. It should be procured in small bottles and used while fresh, the bottle being kept carefully corked.

A good way to prescribe castor oil is in elastic capsules, the 2.5 c.c. size being none too large for the average adult. To make such capsules go down easily, it is well to advise that they be dipped in water for a minute before taking them, and to remind the patient to look down while swallowing, just as he does when he swallows food. Holding the head up while attempting to take pills or capsules is one of the chief causes of inability to swallow them. Two of these capsules often suffice for a satisfactory result. If a much larger amount is required, it is best given floating, in the form of the so-called "sandwich" dose. If the following directions are carried out, the dose can be swallowed without tasting the oil:

In a small tumbler or medicine glass is placed a layer of thick syrup of any flavor desired. The glass is inclined in such a way as to coat its inside almost up to the rim. Then the oil is poured into the center of the glass, care being taken that it does not run down the side. This is topped with a layer of pleasantly flavored fluid, such as orange juice. While the dose is being taken, the edge of the glass should be placed on the lower teeth, so as to avoid straining the oil through the teeth, to which some of it might adhere. When correctly taken, the oil follows the aromatic fluid, gliding down the tongue on the surface of the syrup, without at any time touching the gustatory membrane. Of course, the patient must take the whole dose at one gulp.

The small infant needs no disguise for castor oil. Taste sensation is not sufficiently developed for it to object to so bland a thing as this oil. It will lick the oil from the spoon. As soon as taste sensation asserts itself, however, we should do something to disguise the dose for the child, unless we deliberately inflict it on the youngster as a punishment. As such, by the way, it is used as a remedy, prophylactic as well

as curative, for the little fellow who habitually overeats, or the school child malingering because of a dreaded examination. In both instances, a day of fasting is a good adjuvant to the dose of castor oil. However, because of the prejudice against medicine in general which such practice is likely to engender, it is questionable whether some other method of punishment could not be easily found that would be less detrimental, just as threatening to call a physician when the child does not behave makes the youngster afraid of the doctor, when it would be to the child's interest to cultivate the feeling in the little one that the physician is the children's friend, the best friend a sick child can have.

Sweetening the castor oil and making it aromatic is a good way of disguising it for the child. By means of saccharin (0.05 per cent.) dissolved in alcohol (3 per cent.), castor oil can readily be sweetened. When this is flavored with aromatics (vanillin, 0.1 per cent, coumarin 0.01 per cent) and volatile oils (oil of cinnamon 0.3 per cent, oil of clove 0.1 per cent.), we have the aromatic castor oil of the National Formulary (*oleum ricini aromaticum*, N. F.), which is palatable excepting for the acidity left after it is swallowed. This can be eliminated by using a non-acrid oil, such as Kellogg's "tasteless." Children, however, take aromatic castor oil readily, even when made from ordinary oil, as they usually do not associate the after-sensation with the dose that has been swallowed. We may, therefore, consider the problem of the administration of castor oil to children solved by this means.

In view of the N. F. formula, which can be compounded by any pharmacist, it is hardly necessary to specify a proprietary preparation. Should such speci-



fying seem expedient, oleum ricini dulce, marketed by the Pitman-Moore Company, Indianapolis, might be mentioned as an example of such a preparation on the market.

The following method is also of practical value, as it enables one to administer a "tasteless" castor oil without the patient's knowledge, and is useful, therefore, for those children who unreasonably object to medicine of any kind. By vigorously shaking "tasteless" oil, with a liberal excess—at least four times as much—of *hot* milk, in a bottle which they do not more than half fill, and then having the dose taken *immediately*, the mixture will be found scarcely distinguishable from rich milk. Such oil might also be given floating on *hot* soup. However, a protest should be entered here against administering ordinary castor oil mixed with an important food. This might create in the child a disgust against this article of diet that may last for years.

Thorough emulsification lessens the activity of castor oil, probably because in this form it is too rapidly digested and assimilated. A 35 per cent. emulsion of castor oil can readily be prepared and made palatable. A formula for such a one is to be found in the National Formulary under the name of emulsum olei ricini, N. F. It is flavored with tincture of vanilla. The British Pharmacopeia has a similar formula of different flavor (orange flower and cinnamon) under the title *mistura olei ricini*, B. P. However, as a babe might require a tablespoonful, and an adult a wine-glassful or more, of such emulsions, these preparations are not economical ones, to say the least.

Medicine is still one of the dreaded bugbears of childhood, and castor oil is a leader of these. Let us

admit that it is poor technic to insult the palate—the sensitive guardian of our system against chemical injury—when medicine is to be given. It is no longer necessary, and certainly inexpedient. The patient may take the dose ; but he does so with open or smothered revolt.

## CHAPTER VI

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### BRAN

That constipation is a disease of civilized man and due to the use of concentrated food is a bromidic commonplace, the truth of which might, however, be challenged. If the food of savage man represents a more advanced stage of evolution than the bulky food of cattle, then our still more concentrated diet must be considered a further step in advance. It is true that the progress of civilization has been accompanied by such refinement of food and elimination of indigestible residue, chiefly cellulose, as to lead to the production of a smaller quantity of fecal matter and to less frequent bowel evacuation. This tendency is not in itself evil. Most of us enjoy this concentrated and partly predigested food, and many of us thrive on it. It must, however, be admitted that the intestine of some may not have become adjusted to this ballast-poor diet, that the condition within the bowel of such persons may become pathologic, and that it is necessary for them to return more nearly to the diet of their ancestors by increasing the indigestible residue in their food.

The "back to nature" cry of the health faddist need not lead us to the habitual admixture of sawdust, bran or similar substances to our food. When, however, there is constipation, the question whether increase in cellulose is indicated is important. Unless the patient is of the type characterized by excessive digestion of cellulose and flatulence therefrom; and unless the patient suffers from gastric motor insufficiency or intestinal stenosis, we should favor cellulose in the diet. There are three forms in which cellulose may be added

to the diet: as fruits, vegetables and bran. Of these, bran is the richest in cellulose and is one of the most effective prophylactics of constipation.

It is strange that physicians do not make more frequent use of bran, when its laxative properties have so long been recognized in the very general use of bran mash to correct a tendency to constipation in farm animals. The evident reason for this is that bran is not a drug, and hence there is very little information regarding it to be found in the books ordinarily in the hands of medical practitioners.

Owing to its toughness, bran, the outer covering of wheat, is exceedingly difficult to reduce to a fine powder. The trouble and expense of grinding it is so great that one of the first steps in the milling of flour is the removal of it. However, on rejecting the bran, the miller discards some of the useful constituents of wheat, as will be seen from its composition:

Water,	12.5	Starch and sugar,	43.6
Nitrogenous matter,	16.4	Cellulose,	18.0
Fat,	3.5	Mineral matter,	6.0

The most significant constituent of bran is its cellulose, of which it contains almost 20 per cent. This cellulose is in a dense woody form, almost indigestible in the human digestive tract. As the nutritive constituents of bran are enclosed within walls of this indigestible cellulose, much of them passes through unchanged. Bran is therefore chiefly to be looked on as a form of almost indigestible carbohydrate, which is endowed with considerable laxative value, not only because it adds by its bulk to the distention of the intestine, but also because of the spicate shape of its particles. Excessive irritation does not result from these; for, when properly moistened and heated, bran becomes as soft and pliable as wet paper, and hence

produces merely a gentle titillation and is usable even in patients with a tendency to colic. Some of the cellulose undergoes fermentation, giving rise to gas and acid, both of which are laxative. It is furthermore possible that there is a chemical laxative factor present in bran itself, for W. H. Jordon, E. B. Hart and A. J. Patten of the New York State Experimental Station found that the laxative action of bran for cattle was lost when the soluble phosphorus compound named phytin had been extracted. These experiments will have to be confirmed for man.

The dose of bran is a considerable amount: tablespoonfuls rather than teaspoonfuls; two of them rather than one; and taken several times, at least twice daily, best with meals, and indefinitely. We do not have here a cure for constipation in the sense that its use can, after a while, be discontinued. It is generally necessary to employ bran as a regular ingredient of the diet: hence the importance of making the patient enjoy its use, and the desirability of making it an integral part of the meals by means of cookery. Of course, the patient may take it, as is often recommended, stirred into a glassful of water after meals. Sooner or later, however, he will get tired of this uninviting potation, and "forget" to use it. Let the bran enter the kitchen and have the cook see to it that the patient takes enough by making it up into dishes so palatable and diversified that one will never tire of taking it. It is only when used in this way that bran really "cures," or takes care of constipation.

The subjoined cooking recipes <sup>34</sup> might furnish some suggestions for the palatable administration of bran.

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34. Adapted chiefly from Frances E. Stewart's "Cookery for Invalids" (Rand McNally & Co., 1920) and Alida Frances Pattee's "Practical Dietetics" (Mount Vernon, N. Y., published by the author, 1910).

There are, of course, many other ways, among which may be mentioned: graham or whole meal bread and crackers; bran with cream and sugar; bran mixed, up to one third, with breakfast cereal; bran added to vegetable purées and to fruit sauces; bran incorporated in fish cakes, minced meat, etc. Perhaps the best way to serve it is in bakery products, in which bran may replace white flour up to the extent of 50 per cent. Even pie crust may thus be made with bran.

### BRAN RECIPES

#### BRAN POTATO SOUP

Mash potatoes, add water, milk or cream to make a thin cream, and then strain. To every cup of this thin cream add:

$\frac{1}{4}$ cup bran	Salt, celery salt and paprika
$\frac{1}{2}$ tablespoonful butter	

Bring mixture to the boiling point, and serve.

#### BRAN MUSH

2 cups bran	1 teaspoonful salt
2 cups boiling water	1 cup chopped figs or dates

Add bran to boiling salted water and boil from three to five minutes. Cook one hour in a double boiler, adding the figs or dates ten minutes before the mush is done.

#### BRAN MASHED POTATOES

2 cups hot mashed potatoes, freshly prepared	1 to 3 tablespoonfuls butter
$\frac{1}{4}$ teaspoonful pepper	$\frac{1}{3}$ to $\frac{1}{4}$ cup hot milk or cream
$\frac{1}{2}$ teaspoonful salt	$\frac{1}{2}$ cup bran

Add the four seasonings to the potatoes and whip mixture until it is light. Stir in the bran and serve.

#### BRAN GRIDDLE CAKES

1 cup bran	$\frac{1}{2}$ teaspoonful salt
1 cup flour	1 teaspoonful baking powder
1 tablespoonful sugar	1 cup milk
$\frac{1}{2}$ tablespoonful butter or substitute	1 egg

Mix dry materials, add egg slightly beaten and milk and butter, or substitute. Beat thoroughly and bake on a hot griddle. Serve with butter and syrup. This will make twenty cakes.

## SWEET MILK BRAN BREAD OR MUFFINS

3 cups bran	$\frac{1}{4}$ cup sugar
3 cups white flour	2 cups milk or water
$2\frac{3}{4}$ tablespoonfuls baking powder	2 eggs, beaten very light
2 teaspoonfuls salt	$\frac{1}{4}$ cup fat, melted and cooled

Mix the dry ingredients together thoroughly. Mix the liquid ingredients (including the fat, melted and cooled somewhat). Add the dry to the liquid ingredients, and mix only enough to blend them well. Bake in either of these forms:

As bread: Fill a greased bread tin two-thirds full of mixture and bake it forty-five minutes in a slow oven.

As muffins: Fill greased muffin tins two-thirds full of mixture and bake from twenty to thirty-five minutes in a moderate oven, 342 F. or 190 C.

## SOUR MILK BRAN BREAD OR MUFFINS

2 cups bran	2 cups thick sour milk or butter-milk
4 cups graham flour	
1 teaspoonful soda	2 teaspoonfuls fat, melted and cooled
2 teaspoonfuls salt	
1 cup molasses (not black)	

Directions same as in preceding recipe excepting that the baking time for bread should be one and one-fourth hours.

This bread is almost as sweet as gingerbread. Children usually like it. When desired less sweet, reduce the molasses and increase the sour milk accordingly.

## YEAST BRAN BREAD OR MUFFINS

$1\frac{1}{2}$ cups milk	$\frac{1}{2}$ cup lukewarm water
3 teaspoonfuls molasses (avoid black)	$2\frac{1}{4}$ cups white flour
3 tablespoonfuls fat	$1\frac{3}{4}$ cups graham flour
$1\frac{1}{2}$ cakes compressed yeast (size $1\frac{1}{8}$ by $1\frac{1}{8}$ by $\frac{3}{8}$ inch).	1 tablespoonful salt
	2 cups bran

Scald the milk, then cool it to blood temperature. Blend the molasses, fat and yeast with the lukewarm water to make a smooth paste. Add the molasses mixture to the lukewarm milk. Add flour to make a sponge, or thick batter. Beat the sponge from three to five minutes, cover, and put in a warm place until it is double in bulk.

Add salt and bran, and beat dough hard from three to five minutes in a bowl, using a wooden spoon. The dough should be of the consistency of soft baking-powder biscuit dough.

Half fill with dough a well-greased bread tin or muffin tin; then lightly rub the top of dough with fat.

Let dough stand in a warm place until it is double in size; then bake. Do not jar the dough while putting it into the oven, else it is likely to fall. Bake one hour.

Raisins, from one-half to 1 cup (soaked from one to two minutes in boiling water and then dried) or one-half cup of English walnut meats cut in slices, or both, may be added if desired.

## BRAN BISCUIT

$\frac{1}{2}$ cup wheat bran	1 teaspoonful melted butter
$\frac{1}{2}$ cup improved graham flour	1 saltspoonful salt
1 teaspoonful baking powder	Milk

Sift dry ingredients, rub in the butter, and add milk to make a soft dough. Roll it out and bake in hot oven.

## BRAN COOKIES

1 cup bran	1 cup sugar
1 cup white flour	$\frac{1}{4}$ cup molasses
$\frac{1}{2}$ cup graham flour	$\frac{1}{2}$ cup milk
2 tablespoonfuls butter or lard	$\frac{1}{2}$ teaspoonful salt
2 teaspoonfuls baking powder	1 egg

Beat together butter and sugar, egg and milk. Add dry ingredients. Drop the mixed batter with spoon on well-greased pan. Bake about twenty-five minutes in hot oven. This makes three dozen cookies.

Raisins may be added as follows: Wash the raisins, let them soak in warm water to cover, and then boil them in this water until they are plump. Drain, dry and chop them.

Cinnamon, nutmeg and chopped nuts may be added to the list of ingredients, if desired.

To vary the recipe, the cookies may be spread with cooked and chopped figs or dates, and dusted with powdered sugar.

## BRAN MACAROONS

1 egg	1 cup almonds (finely chopped)
1 cup granulated sugar	$2\frac{1}{2}$ tablespoonfuls bran
$2\frac{1}{2}$ tablespoonfuls flour	

Beat egg and sugar until very light. Add nuts and then flour. Drop on buttered tins, and bake in a medium hot oven ten minutes.



## CHAPTER VII

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### AGAR

Having shown that there existed a variety of constipation, characterized by the passage of a scanty amount of fecal matter in the form of dry, hard lumps, and that this was due to excessive bacterial digestion of cellulose, Adolf Schmidt<sup>35</sup> suggested the use of agar, well known as a bacterial culture medium employed because it is not liquefied or digested by micro-organisms. This substance, a dried mucilaginous material (hemicellulose) extracted by hot water from certain Japanese algae, is almost indigestible in our alimentary tract. Hence it passes through the intestine, adding bulk to the feces and softening them by virtue of its property of retaining moisture.

Agar generally occurs in bundles of translucent pieces, but is best obtained for medicinal use in the form of shreds or coarse powder. When finely pulverized, it may produce colic. It has a slight odor and an insipid mucilaginous taste; it is insoluble in cold water, but slowly soluble in hot water, a 1.5 per cent. solution producing quite a stiff jelly on cooling.

Agar is indicated in those cases of chronic constipation in which it is considered desirable to increase the bulk of the feces, and in which bran is not well borne or does not act well. Persons in whose intestine cellulose is digested to an excessive degree are likely to find bran not only deficient in activity, but, like other fermentable cellulose, troublesome by the production of flatulence. For such, agar may be just the right dietetic corrective. As it is deficient in influence on peristalsis,

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35. Schmidt, Adolf: *Neue Beobachtungen zur Erklärung und rationalen Behandlung der chronischen habituellen Obstipation*, München. med. Wchnschr. 52:1970 (Oct. 10) 1905.

it is likely to be useless in atonic constipation, such as in that of the aged; on the other hand, it may be used in spastic constipation and in mucous colitis.

As in the case of other evacuants acting chiefly in a physical manner, agar must be taken in large and liberal doses, and regularly for a long time. A dose of from 30 to 40 gm. may be required. Usually the patient is directed to take one or two heaping teaspoonfuls once a day, preferably with his breakfast. From two to four days may elapse before an effect manifests itself. If none appears, the patient should increase the amount ingested by taking additional doses with other meals. As much as four tablespoonfuls and even more may be needed. In such a case, it is best to employ some other evacuant instead, or in addition. Children of 4 or 5 may require two teaspoonfuls (4 gm.) daily. Once regularity has been established for a week or two, the patient should tentatively reduce the dose, to discover the smallest amount required by him; and this may have to be continued many months, perhaps indefinitely. As it, therefore, is really an article of diet, we must invoke the art of cookery to make the patient relish taking the remedy, or it will be discarded sooner or later, even though it produces a satisfactory result.

Adults usually prefer to take it in shredded form (cut agar). This may be eaten with cream and sugar. Many prefer to eat it mixed with gruels or any of the ordinary cereal breakfast foods. It may also be added to cooked fruits, vegetables or thick sauces. For the adult, however, it should not be cooked with the food. Agar may be used, instead of bran, in the various cooking recipes given in connection with bran. When used in the making of cakes, biscuits or cookies, it should always be added just previous to baking.

Children require agar in finely granular or liquefied form. When shredded agar is given in their food, many

of them will carefully separate each piece in their mouth and spit it out. To liquefy agar, it must be boiled with water until it has become thoroughly homogeneous. Several hours' hard boiling may be required. Thus it may be cooked up with cereal or in soup; but such dish must not be allowed to cool before it is eaten, otherwise it will gelatinize. Of course, agar may be eaten in the form of jelly. Strauss<sup>36</sup> gives this recipe for an agar jelly:

Wash 5 gm. of agar in cold water, then soak in hot water, and boil with from 300 to 400 c.c. of water until clear. Strain through gauze, and add any one of the following flavorings: wine, sugar and lemon peel, coffee, cacao, cream, yolk of egg, etc., and set aside to cool.

The limitations of agar as a laxative are perhaps best shown by the fact that Adolf Schmidt, who first proposed its use for this purpose, found it necessary to make it more reliable in its activity by adding 25 per cent. of aqueous extract of cascara sagrada. This combination of Schmidt's is being promoted as a proprietary medicine. One of the objections to such a combination is the impossibility of varying the relative dosage of its ingredients. If it is found necessary to supplement agar with an active cathartic, let the cathartic be given separately. Then it will be possible to adjust the dosage to the needs of the individual patient; and it will also be possible gradually to reduce the dosage of the active cathartic until the patient is finally weaned from it. While it may be admitted that little, if any, harm could come from using agar indefinitely, it is certainly true that the indefinite consumption of cascara sagrada, or of any other active cathartic, leads to habituation of this drug.

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36. Strauss, H.: Obstipation und Diarrhoe als Objecte der Diätsbehandlung, Deutsch. med. Wchnschr. 39: 1537 (Aug. 7) 1913.

## CHAPTER VIII

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### CASCARA SAGRADA

The former official name of this drug, *rhamnus purshiana*, so called after F. T. Pursh, who described the plant in 1814, has been changed by our present pharmacopeia in favor of the older, shorter, and more euphonious name *cascara sagrada* (sacred bark), given to it by the early Spanish settlers of California, who found this bark used by the native Indians as a cathartic.

Though it was not until 1878 that the drug was introduced, it gained in favor so rapidly that it is now official in all the pharmacopeias excepting the Finnish and the Portuguese, and it is one of the most generally used drugs. Granting that, like all other cathartics, it is employed much oftener than it should be, and admitting that there is such a thing as fashion in the use of drugs, yet we must recognize that a substance with such a history must have some merit.

Experience shows that it is a mild yet reliable cathartic, quite free from tendency to griping and almost devoid of contraindications, a remedy which does not readily lose its effect on prolonged use. As it acts by stimulating peristalsis, it is especially indicated in atonic constipation, such as that of the bed patient. It is mild enough to be used in pregnancy. It would, of course, be contraindicated in spasmodic constipation. Occasionally one finds a patient in whom it fails to act. For such, senna forms a good succedaneum.

Cascara sagrada is rather slowly acting, requiring from six to ten hours for effect. Hence, when a single dose is to be given, it is best administered at bedtime.

More commonly, and perhaps more efficiently, it is employed for the purpose of increasing the irritability of the intestinal musculature by being administered in divided doses, either before or after meals, and at bedtime.

Its chief drawback is its intensely bitter taste. This is so marked that cascara should not be prescribed in its bitter form without asking the patient whether he is willing to take bitter medicine. However, the bitter taste can be practically abolished by treating the bark with an alkali, such as magnesia, during its extraction. This is done in the preparation of the *aromatic fluid-extract of cascara sagrada*, U. S. P., which, sweetened with glycyrrhiza, glycerin and saccharin, and flavored with a mixture of anise, cinnamon, coriander and wintergreen, constitutes a veritable masterpiece of pharmaceutic disguising. It is pleasant enough for children to take without protest. However, the bitterness is removed at the expense of some activity, so that the relation of efficiency of the aromatic fluidextract to the fluidextract is as 1 to 3 or 4. This can, of course, be remedied by sufficiently large dosage. For the children, to whom the administration of the bitter fluid-extract is little less than inhumane, the following dosage of the aromatic fluidextract may be required:

	C.c.
Child, 6 months old .....	1
Child, 18 months old .....	From 2 to 3
Child, 3 years old .....	4
Child, 5 years old .....	From 4 to 8
For adults .....	From 4 to 15

The expense is probably the only objection to using this preparation in the adult, for the plain or bitter *fluidextract of cascara sagrada* is effective in much smaller dosage (from 1 to 4 c.c.). The bitterness of this preparation is best overcome by having the patient

put the dose into gelatin capsules just before taking. One or two of the larger sized gelatin capsules (00) filled with the fluidextract generally suffices to secure daily evacuation, especially when taken after each meal and at bedtime. Owing to the presence of 75 per cent. water in the fluidextract, such capsules cannot be kept on hand or prepared by the druggist. Patients readily fill these capsules for themselves, when provided with a medicine dropper.

The bitter fluidextract taken without encapsulation might be valuable in a case in which, in addition to constipation, anorexia is to be combated. For such a patient, this prescription might be of advantage:

	C.c.
℞ Fluidextract of cascara sagrada.....	30
Compound tincture of gentian .....	30
Mix. Label: One-half to one teaspoonful, in a little water, half hour before meals.	

In this prescription the compound tincture of gentian is merely used as a vehicle to avoid prescribing of dropdosage, which, being less convenient, should be employed only when distinct advantage is gained thereby, as in case of ascending or descending dosage. To this prescription, tincture of nux vomica might be added with possible advantage in doses of 1 c.c., unless the patient is suffering from excessive reflex excitability.

It is often successfully employed as an adjuvant to the dietetic and exercise treatment (discussed under "Bran and Agar") of chronic constipation, in the following manner: The patient, provided with a prescription for the fluidextract (bitter preferred, but the aromatic if the patient objects to bitterness), should first of all determine the smallest dose required by him to obtain an action of the bowels at least once and not more than twice a day. He should be told

that the medicine is merely given him to provoke a call to stool; and that, if this is neglected, the previous day's dosage has been wasted. As initial dose a half teaspoonful might be suggested, to be taken before meals and at bedtime. This dose is used regularly for a week; then half the dose is continued for a week; and this again cut in half and taken for a week; and so on, until it has been reduced to but a drop or two, when it might be discontinued. A patient who fails to respond to a faithful application of this combination therapy is in need of some form of physical treatment (enemas, massage, electrotherapy or surgery), after a careful and thorough study of his case (including roentgenologic examination); and, if physical therapy is inapplicable or fails, may have to be fitted with a habitual cathartic, for which purpose administration in pill form is best.

The *extract of cascara sagrada* is the least reliable cascara preparation. While the average dose of this preparation is given by the pharmacopeia at 0.25 gm., which makes a good sized pill, even two or three times this dose may fail. Extract of aloes is so much superior a cathartic for administration in pill form that the extract of cascara sagrada is likely to be useful only in the most sensitive cases of obstinate constipation.

## CHAPTER IX

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### SENNA

As a purgative, senna is more powerful than cascara sagrada, and often acts when the latter fails. It requires from four to eight hours for effect. Large doses are therefore better given in the morning; small doses may be administered at bedtime. It is much more prone to produce griping, and in some patients to cause a feeling of abdominal soreness. On the principle that the mildest is the best, cascara is to be preferred to senna, especially for prolonged use. When, however, a single prompt, thorough evacuation is aimed at, senna is the superior.

Roentgenoscopic examination has demonstrated that senna exerts its chief effect on the large intestine. The movements of stomach and small intestine are not markedly changed; but, the moment the bismuth meal passes the ileocecal valve, it traverses the colon in great haste. This makes senna useful to complement the action of duodenal purgatives, such as the mercurials, and shows the rationale of the old prescription of blue mass at night and "black draft" in the morning.

From therapeutic doses there is little tendency to hypercatharsis, inflammation, or to constipation after its use. However, as senna is the most drastic of the purgatives, it is particularly contraindicated in spastic constipation and in conditions of intestinal inflammation. For patients with hemorrhoids it should be prescribed with caution and only in small doses.

We must remember that the coloring matter of senna gives to acid urine a deep yellow color, and that this urine becomes red under the influence of alkali. The latter appearance might give rise to the false fear of



the presence of hematuria. Some of the cathartic principle is eliminated into the milk of nursing women. Hence, purging the mother may also purge the nursling.

The taste of senna, though bitter, is not nearly as intense as that of cascara sagrada; and it is more easily disguised. Thus the official *syrup of senna*, containing 25 per cent. of the fluidextract and flavored with coriander, is sufficiently pleasant for most children to take without protest. The *aromatic syrup of senna* of the National Formulary is still more pleasant and of only half the strength (12.5 per cent.), though it also contains, and probably unnecessarily, 5 per cent. of jalap, 1.75 per cent. of rhubarb, and 30 per cent. of alcohol. It is flavored with cinnamon, cloves, nutmeg and lemon. A teaspoonful of the official syrup or two teaspoonfuls of the aromatic would be sufficient to act on a sensitive adult or an older child. A 1-year-old babe would be acted on by 15 drops of the National Formulary preparation. As these syrups are readily available, it is surely, to say the least, inexpedient to prescribe such nostrums as "castoria" and "syrup of figs," which owe their value chiefly to senna.

In coffee or prune juice the taste of senna is hardly noticeable. It is recommended that senna leaves (2 gm.) be added to ground coffee (8 gm.) and infused with 90 c.c. each of hot coffee and hot milk; or else a teaspoonful of senna leaves be tied up in a small muslin bag and stewed with 250 gm. of prunes, in either case adding sweetening to taste. Senna forms the laxative ingredient of nearly all the various "herb teas," so much used by grandmothers. In these days of the automobile and the aeroplane, however, the slow and tedious, even though economical process of domestic extraction, is bound to become obsolete. Coffee or prune juice may more readily be made purga-

tive by the addition of a dose of syrup or of fluid-extract of senna.

The most pleasant way of taking senna is to use the powdered leaves, letting the alimentary tract do its own extracting. Thus, the *compound powder of glycyrrhiza* owes its popularity to its rather pleasant taste. It contains 18 per cent. of senna, glycyrrhiza and sugar for sweetening, and oil of fennel for flavoring. The sulphur contents (8 per cent.), would probably not be missed if it were deleted from the formula; for sulphur is a very feeble agent as compared with senna. The dose of compound powder of glycyrrhiza for an adult is a teaspoonful or more stirred up with water. For children, the dosage given in the accompanying tabulation may be employed.

DOSAGE OF COMPOUND POWDER OF GLYCYRRHIZA  
FOR CHILDREN

Age of Child	Gm.
6 months .....	0.60
1 year .....	0.90
2 years .....	1.20
3 years .....	2.00
5 years .....	3.00

The *confection of senna* was very properly deleted from the present pharmacopeia. By no stretch of the imagination could it have been called a confection in the modern sense. A more pleasant preparation can be made in any household after the subjoined formula, which will yield a candy medication of approximately the same strength and dose as the compound glycyrrhiza powder.

LAXATIVE FRUIT CAKE

Senna leaves .....	} Of each, equal parts
Figs .....	
Dates (freed from stones) .....	
Prunes (freed from stones) .....	
Raisins (seedless) .....	

Chop fine in a chopping bowl, mix by kneading, roll into cylinders as thick as a thumb.

Dose: 1 slice, larger or smaller according to size of the patient.

Perhaps the very pleasantness of this preparation is a disadvantage, as it may invite unnecessary use, and thus lead to the pernicious practice of habitual catharsis.

The *fluidextract of senna* might be used in a manner similar to that of *cascara sagrada* and for the same purpose—to increase intestinal irritability—in the curative treatment of chronic constipation, in doses of from 0.5 to 1 c.c. several times daily, and progressively reduced; or else in dose of from 2 to 4 c.c. for a single thorough evacuation. The addition of from 0.25 to 0.50 c.c. of tincture of belladonna to each dose, to antagonize griping, is suggested, though the patient may object to the dryness of the mouth and the impairment of vision produced thereby.

Little can be said in favor of the old abominably tasting "black draft," the *compound infusion of senna*, excepting on the score of its efficiency. It is a relic of the days, fortunately now past, when nauseous medicine was given by the teacupful. The combination of senna (6 per cent.), which is chiefly a stimulant to peristalsis, with magnesium sulphate (12 per cent), which keeps the feces fluid but does not have much effect on the musculature, is an instance of good synergism. The manna (12 per cent.), on the other hand, is too feeble in activity and in taste to be of much value either as an adjuvant or as a corrective. Fennel is used as flavoring. The average dose of 120 c.c. of this preparation will open the bowels, if it is within the power of any cathartic to do so. It might be remembered as a last resort, when other cathartics have failed and intestinal obstruction is probably not present. When it fails, a strong suspicion of mechanical inter-

ference with intestinal evacuation may be entertained. Of course, when intestinal obstruction is known to be present, this powerful agent is decidedly contraindicated, as it is more dangerous than the surgeon.

## CHAPTER X

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### PHENOLPHTHALEIN

About twenty years ago the Hungarian government decreed that wine, adulterated by certain harmless additions, be earmarked by means of phenolphthalein, because of the property of this substance of assuming a brilliant red color on addition of alkali, and of its supposed harmlessness. This was done with the intention of enabling the poor man to buy this "necessity of life" at a price within his reach. But it was soon found that people partaking freely of this wine suffered from diarrhea, which at one and the same time led to a hasty repeal of the law and the discovery of a new purgative.

This recent addition to the cumbersome list of cathartics is of interest only because of the fact that it is almost tasteless and is active in small doses. It lends itself admirably to palatable administration, even to being given in the form of bonbons, which makes it especially suitable for children and for the insane; though women generally and even men prefer it on account of the inoffensiveness of its taste.

It is a yellowish-white powder, odorless and almost tasteless, very slightly soluble in water, and soluble in alcohol (13 parts) and in aqueous solutions of alkalis, yielding a pink fluid. It is also soluble in olive oil to the extent of about 2 per cent.

Being insoluble in acids, it passes through the stomach unchanged; hence it may be given in conditions of gastric irritation when many other cathartics would be contraindicated. On reaching the intestine, it is partially dissolved in the alkaline secretions, becoming converted into salts which are irritant, and thus becoming active. Very little is absorbed; more than

85 per cent. of it has been found unchanged in the feces. After large doses, however, traces are found in the urine, which then turns pink when rendered alkaline by decomposition or otherwise. That it does not irritate the kidney is shown by the fact that subcutaneous injection of a very similar substance—phenolsulphonaphthalein—has become an accepted test for the functional capacity of the kidney. There are no known systemic effects produced after absorption.

Phenolphthalein probably acts chiefly by influence on peristalsis; in other words, it belongs among such drugs as cascara sagrada and senna, so far as mode of action is concerned. It is even effective as a cathartic when given subcutaneously, though Abel and Rowntree<sup>37</sup> found phenoltetrachlorophthalein (0.4 gm. in 20 c.c. of oil) superior for this purpose.

The chief disadvantage of phenolphthalein is a certain degree of variability of action. At times, a small dose acts excessively; at times, a larger dose fails to act. An overdose, and in especially susceptible persons even a therapeutic dose, may cause, in addition to free purgation and colic, rapid pulse, palpitation, difficult breathing and general uneasiness, even collapse. The substance is otherwise quite free from toxic tendency. Doses of several grams have been tolerated without more severe effects than those just detailed. There are no fatal cases on record.

It should be borne in mind that phenolphthalein may cause reddish stools, when the reaction of the evacuation is alkaline, or is made so by a soap enema, for instance. Under such circumstances, the suspicion may arise that there is blood in the stools. Of course, the diagnosis can readily be made by the fact that

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37. Abel and Rowntree: *J. Pharmacol. & Exper. Therap.* 1:231 (Aug.) 1909.

acidification removes the color, which reappears when excess of alkali is added. In view of the frequency with which this drug is now being used, we must beware of making a diagnosis of blood in the stools by mere inspection.

The dose of phenolphthalein for adults is from 0.10 to 0.20 gm. ( $1\frac{1}{2}$  to 3 grains). The U. S. Pharmacopeia states that the average dose is 0.15 gm., or  $2\frac{1}{2}$  grains. As little as 0.06 gm. (1 grain) is often sufficient for an adult, and this dose is none too large for a child. Babies aged 18 months are given 0.03 gm. (one-half grain). In obstinate cases, as for instance bed-ridden patients, from 0.5 to 1.0 gm. (8 to 15 grains) may be given without fear. It will be noted that, on the whole, the dose of this drug is quite independent of age. It is also true that at any age the effect is somewhat independent of dose. Evidently the activity depends on the amount of alkali in the intestine available for solution; and it is probable that variation in intestinal reaction accounts for the variability in intensity of action.

As phenolphthalein is a comparatively slowly acting drug, requiring from six to twelve hours for effect, it is generally given at bedtime. While, when large doses are needed, these would best be prescribed in powder form, the usual method of administration for the ordinary dose is in the form of sweet tablets to be eaten like candy. The National Formulary contains a formula for pink, vanilla flavored *troches of phenolphthalein*, each containing 0.06 gm. (1 grain) of the drug. These are made with acacia, and therefore disintegrate rather slowly. This is undesirable. Lozenges made in this way are suitable for mouth and throat medication; more rapid disintegration is desir-

able in candy medication for systemic action, as sick children sometimes refuse to suck candies that healthy children would enjoy. Friable tablets can be obtained by light compression in a tablet machine. The following formula<sup>38</sup> will yield such a product, which can be prepared extemporaneously by a pharmacist equipped with a tablet machine. Without compression into tablets the same formula yields a palatable powder.

**SWEET TABLETS OF PHENOLPHTHALEIN, 0.06 GM. EACH**

Phenolphthalein .....	6.00 gm.
Saccharin .....	0.12 gm.
Tincture of vanilla .....	1.50 c.c.
Cacao powder .....	3.00 gm.
Sugar, powdered .....	21.00 gm.

Mix the saccharin with the tincture of vanilla and incorporate the phenolphthalein. Finally add the sugar and the cacao by thorough trituration in a mortar. Compress in a tablet machine, using  $\frac{3}{8}$ -inch die and punches, to make 100 0.30 gm. tablets.

All the various manufacturing houses of pharmaceuticals put up fairly acceptable sweet tablets containing 0.06 gm. each and up to 0.30 gm. Such tablets might simply be prescribed for as follows:

Rx 12 Sweet tablets of phenolphthalein..0.06 gm. (1 grain) each  
Label: One or two at bedtime.

For infants, sweet tablets might be crushed and given in a little water.

The novelty and the inoffensiveness of this remedy has rendered it an inviting object for commercial exploitation. Soon after its introduction, the market became literally flooded with phenolphthalein in various disguises and combinations, the only original feature of most of which was a coined name. The following is a partial list of names under which phenolphthalein preparations and combinations are or were advertised:

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38. From Fantus, Bernard: Candy Medication, St. Louis, C. V. Mosby Company, 1915.



Alophen,	Paraphtalein,	Purglets,
Cholelith Pills,	Phenalein,	Purgo,
Elzernac,	Phenolax Wafers,	Purgolade,
Ex Lax,	Phenolphthalein Laxative,	Purgotin,
Exurgine,	Probilin,	Purgylum,
Laxophen,	Prunoids,	Rhuphen,
Laxine,	Purgatol,	Thalosen,
Laxirconfect,	Purgen Konfect,	Veracolate,
Laxothalen Tablets,	Purgella,	Zam Zam.

What a Babeldom would arise in medical practice if this business policy of manufacturers to protect their product by coined names were encouraged by the patronage of physicians. Self-respecting manufacturers owe it to the progress of medical science to do away with such camouflage for revenue only; and the medical profession owes recognition to these manufacturers by prescribing products by their scientific names.

## CHAPTER XI

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### THE CATHARTIC SALTS

"Taking a dose of salts" is generally considered an easy and simple way of producing an evacuation of the bowel. Consequently few medicaments are more generally used—and abused—by both physicians and laymen than are the saline cathartics. These salts, in fact, belong among the habit-producing drugs, and are responsible for a large proportion of cases of cathartic habit. That they are occasional accessory causes of death from ileus and appendical and other forms of peritonitis is only too well known to the surgeon.

The chief effect of the salines is to interfere with the absorption of some of the ingested water, so that it is eliminated into the stool instead of passing through the system. They do this, presumably, because they are practically nonabsorbable in the alimentary tract and therefore retain enough water in the colonic contents to render them isotonic with the blood.\*

As an isotonic solution of sodium sulphate is 2 per cent. of the dried (4 per cent. of the crystalline) salt, it would take 500 c.c. (1 pint) of fluid to carry out of the system a dose of 10 gm. (2½ drams) of this salt. In case of magnesium sulphate, 7.5 per cent. of which is isotonic, the proportion of water abstracted is somewhat greater, because this substance is converted in the intestine into magnesium bicarbonate and sodium sulphate, both of which are soluble and practically nonabsorbable. Evidently this is why magnesium sulphate is a more efficient purgative than

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\* Other theories have been advanced to explain the action of these agents. Space for the discussion of these is not taken here, as they do not influence their use.

sodium sulphate. Magnesium citrate, on the other hand, yielding sodium citrate and magnesium bicarbonate, is proportionately less powerful than magnesium sulphate, to the extent that sodium citrate is a feebler cathartic than sodium sulphate.

#### ILL EFFECT ON THE STOMACH

When the salts are ingested in any other than isotonic strength, they are rendered isotonic in the stomach. In case of strong salt solutions, this is accomplished at the expense of delayed evacuation of the stomach and irritation of the gastric mucosa. We may, therefore, formulate the rule that *salines should be given in dilute solution—generally, a teaspoonful to a tumblerful of water—unless abstraction of fluid from the system is aimed at*. The gastric distention produced is by no means advantageous to the functions of the stomach. This is so well known that purgative salts are preferably taken on an empty stomach; their ingestion is so timed, that they have largely left the stomach before food enters it, which is ordinarily accomplished by giving them at least half an hour before meals. This presupposes, however, a normal emptying time of the stomach. When there is gastric motor insufficiency—a condition in which fluid is evacuated with difficulty and therefore interferes with digestion—these agents are, as a rule, not well tolerated. The condition of sufferers from gastritis is likewise aggravated by any but most moderate doses of isotonic alkalized solution. When there is nausea or vomiting, these agents, with the exception of magnesia, cannot be administered, for they have a tendency to provoke nausea and vomiting in sensitive persons. These are the reasons that most of the cathartics of this class are practically taboo with the gastro-enterologist, who deals with so many

of these patients. Even their transduodenal administration by means of Jutte's tube has recently been advocated, to spare the stomach the action of these chemicals.

#### EFFECTS IN INTESTINE

While these bodies delay the evacuation of the stomach when they are given in concentrated solution or when they produce diarrhea, the moment they enter the intestine they hasten the onward progress of its contents, producing a liquid evacuation within from one to four hours of their ingestion. Such prompt effect is dependent, however, on good peristaltic activity. When this is deficient, as is likely to occur in those confined to bed, instead of one prompt and comfortable bowel movement in one, two or four hours, several small bowel evacuations may ensue with considerable griping in the course of twenty-four hours. For this reason the salines may be advantageously combined with peristaltic stimulants, as salts and senna, sulphur and cream of tartar. From what has been said it is evident that the best time for giving these salines is in the morning before breakfast: while administering them last thing at night is least likely to produce desirable results.

The rush of fluid through the intestine, induced by saline cathartics, results in a veritable washing out of the bowel, which cannot, however, be complete. Liquid and solid materials are passed along the intestine by different processes. While the rhythmic segmentation movements of the intestine may cause a rapid passage of fluid, solid contents, which depend for their propulsion on peristalsis, may be left behind. While the artificial diarrhea produced may carry away poisons, it also causes the loss of a certain amount of

nutriment. On the latter action is based their use in the treatment of obesity, which, however, is not nearly as rational as diminution in the intake of nutriment. Not much can be said in favor of their action in so-called intestinal autointoxication: for, while they may remove some of the bacteria and the poisons produced by them, the fluidity of the bowel contents and the greater amount of organic matter contained in them may favor the more rapid growth and development of those organisms left behind.

The evacuant action of the salines is chiefly useful when a single flushing out of the bowel is desired to remove, as thoroughly as possible, irritant or otherwise offensive material. As they produce but little irritation in the intestine, they may be used even in the presence of enteritis and in dysentery. Salines are the classical evacuants to be used in connection with mercurials and anthelmintics, and in case of poisoning.

One of the chief faults of the cathartic salines is their deficiency in stimulating peristalsis: indeed, intravenous or intramuscular injection has been shown to inhibit bowel movement. The rapid evacuation produced is due to distention of the intestine with fluid; and this is so marked that salines are particularly obnoxious for preoperative purgation or for evacuation of the bowel prior to a roentgenologic examination of the abdomen. They are contraindicated in chronic atonic constipation, as they not only do not antagonize the underlying pathologic condition, but actually aggravate it by lessening the need for peristaltic activity, as liquid contents are more easily propelled than solid material. Their use in dyschezia (*torpor recti*) is irrational, as in these cases they act no better than an equivalent amount of water injected by rectum; and

it surely is not good sense to upset water absorptive and other physiologic processes all the way down the alimentary canal in order to distend its lowest segment with fluid that might so much more readily and efficiently be introduced from below.

The chronic use of salines is justified only in those cases of constipation due to minor colonic stenosis, even cancerous, and to partial anatomic obstacles (adhesions, etc.) in patients for whom surgical relief is not desirable.

#### SYSTEMIC EFFECTS

The source of the fluid eliminated in the stools in the course of saline catharsis is chiefly ingested water. Even if the saline is not taken in isotonic solution, enough water is ordinarily consumed in our diet to produce isotonicity without abstraction of fluid from the blood. It is only when dry diet and concentrated salt solution are used simultaneously that abstraction of fluid from the system occurs. As a result of such concentration, the red blood count may rise to 7,000,000 per cubic millimeter, to return to normal within the next few hours even if no fluid has been taken. A second less marked rise in the concentration of the blood may be observed during the stage of diuresis. Alongside of this temporary diminution in the volume of circulating fluid there is a tendency to depression of the circulation. This accounts for the feeling of faintness experienced by feeble individuals at the height of action of these agents, as well as for the relief of headaches due to cerebral hyperemia or high blood pressure testified to by others.

In treatment of dropsy, the cathartic salines are perhaps the least harmful among the hydragogues, owing to absence of intestinal irritation. However, their

unfavorable action on the stomach may render jalap or elaterin preferable in certain cases. When given for this purpose, from 15 to 30 gm. ( $\frac{1}{2}$  to 1 ounce) of sodium sulphate (preferable to magnesium sulphate for reasons to be given below), dissolved in from 30 to 60 c.c. (1 to 2 ounces) of water, are taken on an empty stomach, best in divided doses every fifteen minutes until all has been taken. It would be poor therapy, however, to force a patient to take this disagreeable potion, obnoxious not only to the palate but also to the stomach, unless moderate drink restriction is practiced at the same time. The policy of this therapy may be questioned when we realize that mere drink restriction could produce the same result, as far as dehydration of the system is concerned, in a more gradual and less disturbing manner. There are a number of other weighty objections to it. Thus, the salines fail to produce their purgative effect as soon as a certain degree of systemic dehydration has occurred. Under such circumstances they are absorbed; and, if they cannot be promptly thrown out by the kidney, must be retained with an adequate amount of water to maintain isotonicity, thus still further adding to the waterlogged condition of the patient. Furthermore, in the dropsy of myocardial insufficiency, the weakening of the patient by the routine administration of heroic doses of salines more than offsets the benefit to be derived from the abstraction of the small amount of fluid lost in this way. In patients with enfeeblement of the circulation, the drastic use of salines, so commonly practiced, cannot be too strongly deprecated. All this accounts for the observation made, at times, that a patient who at first seemed to improve on this treatment becomes more dropsical again on its con-

tinuance. All that can be said in favor of it is that a dropsical patient should not be permitted to become constipated; and that the gentle use of salines, enough to produce one or at most two liquid stools a day, might be recommended, alongside of moderate drink restriction. When watery bowel movements do not result, the administration of the saline should be stopped.

A note of warning should furthermore be sounded against the use of magnesium salts when there is a suspicion that they might be absorbed instead of being thrown out with the stools, as might occur not only under conditions just described, but also in case of ileus. If the patient cannot get rid of the dose in the usual way, it may, by its absorption, aggravate the existing intoxication and even contribute to a fatal result by the depression of the respiratory center and the curare-like action on muscles inherent in the magnesium ion. An extraordinarily high specific gravity of the urine (even 1.070 or 1.080) is suggestive of magnesium sulphate poisoning. In such a case, the antagonism between calcium and magnesium, demonstrated by Meltzer, might be of practical importance, as well as the hypodermic use of 0.6 instead of 0.9 per cent. salt solution to lessen the prevailing excess in osmotic tension. Sodium sulphate is much safer under these circumstances, as it would be less poisonous if absorbed.

One may well be skeptical that anything can be accomplished by saline catharsis in the way of diminishing the bulk of exudates, such as those of pleurisy with effusion. The most that can be said for the practice is that salines, in moderate doses and given in fairly concentrated solution, may be preferred to



other cathartics to antagonize constipation. Exhausting purging is a display of poor judgment in these cases, as it can only do harm.

To reduce milk secretion in weaning or to lessen engorgement of the breasts in an otherwise healthy woman, drink restriction may be accompanied by use of saline cathartics for a day or two.

#### EFFECT ON URINE

That portion of the saline which is absorbed is chiefly eliminated by the urine, producing a diuretic action in inverse proportion to the cathartic effect. Generally, of course, owing to abstraction of water by way of the intestine, there is a diminution in the urinary secretion for about twelve hours. This is followed by increased secretion of urine for perhaps the next twenty-four hours. Very dilute, as well as very concentrated solution, and also very small doses, or antagonizing the cathartic action by remaining in bed after taking the dose or by the use of morphin, all bring out the diuretic action at the expense of the cathartic effect.

The curious observation has been made that magnesium sulphate increases acidity and ammonium in the urine, while sodium sulphate decreases urinary acidity. The reason for this lies in the different degree of absorbability of the various ions yielded by these salts in the intestine. The magnesium ion is more slowly absorbed than the sulphate ion. Hence, more magnesium remains in the bowel, while the acid ion, in passing through the system, abstracts alkali and acidifies the urine. With sodium sulphate, the reverse is the case. The sodium ion is more rapidly absorbed than the sulphate ion. Hence, an alkaline wave passes through the system and into the urine. This might

cause sodium sulphate to be preferred to magnesium sulphate in conditions of acidosis or when it is desirable to keep urinary acidity low.

#### CHOICE AND ADMINISTRATION

The cathartic salines differ among themselves in potency and palatability, as well as in details of action, all of which determine their choice.

The mildest and most inoffensive of the group is *magnesium oxid*, which, in the form of "milk of magnesia" (*magnesia magma*), is the only cathartic saline admissible in the presence of vomiting. The preparation is so mild in action that it is chiefly suitable as a laxative for infants, with whom 1 or 2 teaspoonfuls added to milk or other feeding daily may suffice as a temporary expedient. To the adult, tablespoonful doses may have to be given repeatedly before laxative effect is obtained. Magnesium oxid is likewise rather feeble in cathartic action, and is more useful as a gastric antacid than as a laxative, especially in view of the reputed danger of formation of intestinal concretions, when it is used for a time in the large doses required for cathartic effect. When magnesium oxid is prescribed by the teaspoonful, its lightness should be borne in mind. Even the "heavy magnesium oxid," the only form that should be employed internally, does not weigh much more than 1 gm. (15 grains) per teaspoonful. True, 2.5 gm. (40 grains) are equivalent in magnesium contents to 15 gm. (240 grains) of magnesium sulphate; but the oxid is much feebler in action, as it lacks solubility and, of course, the sulphate ion. To children, magnesium oxid might be given in the following dosage:

- For 6 months old, from 0.30 to 0.60 gm. ( 5 to 10 grains)
- For 18 months old, from 0.60 to 1.30 gm. (10 to 20 grains)
- For 3 years old, from 1.30 to 2.00 gm. (20 to 30 grains)
- For 5 years old, from 2.00 to 3.00 gm. (30 to 45 grains)

The subjoined prescription yields a palatable administration form for this drug:

℞ Magnesium oxid .....15 gm.  
 Fennel oil-sugar .....30 gm.  
 M. Label: One half of level teaspoonful two or three times daily.

*Sodium phosphate* is undoubtedly, next to magnesia, the least offensive of the cathartic salines. The taste is sufficiently like that of cooking salt to permit its administration in salt-free broth without the knowledge of the patient. It can thus be readily administered to a child. For bottle-fed infants, a dose of from 0.12 to 0.25 gm. (2 to 4 grains) may be added to each bottleful of milk. Dosage for children might range as follows:

For 6 months, from 0.30 to 0.60 gm (0.5 to 10 grains)  
 For 18 months, from 0.60 to 0.90 gm. (0.10 to 15 grains)  
 For 3 years, from 0.90 to 1.30 gm. (0.15 to 20 grains)  
 For 5 years, from 1.30 to 2.00 gm. (0.20 to 30 grains)

For a child 3 years old this salt may be prescribed in the form of the following solution of actually delicious taste:

	Gm. or C.c.	
℞ Sodium phosphate .....	12 0	℥iii
Syrup of raspberry.....	20 0	℥v
Orange flower water to make.....	60 0	℥ii

M. Label: Teaspoonful with water every two hours until evacuation is obtained.

As this is a fairly saturated solution, increase in dosage would be obtained by having the patient take a larger spoonful. For an adult, the dose of this solution would be a tablespoonful. However, adults take it readily in doses of from 2 to 8 gm. ( $\frac{1}{2}$  to 2 drams) in a teacupful of water, as hot as can be borne. Such a dose might be administered once, twice or thrice daily, half an hour before meals; or else the effervescent sodium phosphate may be taken by the dessert-spoonful in half a tumblerful of cold water or lemonade.

For the bitter cathartic salines, cold effervescing solution is the best administration form. The effervescence diminishes their taste: chiefly, perhaps, in a physical manner. Innumerable gas bubbles are formed the instant the cold fluid charged with carbon dioxid comes in contact with the warm surface of the mouth. The tasteless gas, taking the place, to a large extent, of the salty liquid, protects much of the gustatory surface against excitation. Furthermore, carbon dioxid as well as coldness have a depressing effect on the excitability of the gustatory nerve endings. Imparting effervescence to the dose is also of advantage for its effect on the stomach, chiefly because it expedites the passage of ingested material out of the stomach.\* The sedative effect of the carbon dioxid on the gastric mucosa also lessens the nauseating tendency of these salts. These considerations enable one to understand why effervescent preparations are so prominent among the administration forms for soluble salines. It seems self-evident, however, that the administration of carbonated drinks should be avoided in patients with flatulent distention of the abdomen and in those suffering from dyspnea. Likewise is administration in effervescing form contraindicated in patients with cardiac enfeeblement. It is particularly obnoxious in dropsical patients with ascites.

All four available means of imparting effervescence to pharmaceutical products are made use of in the administration of these bodies.

In the preparation of the *Solution of Magnesium Citrate*, the most pleasant administration form for soluble cathartic saline, there is added to the sweetened

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\* This is the reason, for example, for the popularity of "soda water" during hot weather, for water quenches thirst only while it is in the mouth and after it has left the stomach.

and flavored fluid containing magnesium citrate and an excess of citric acid, just before inserting the stopper, a sufficient quantity of crystallized potassium bicarbonate to neutralize the acid. The stopper, having been securely fastened, retains the liberated carbon dioxid under pressure, so that on removal of the stopper copious effervescence ensues. The dose of this solution for a vigorous adult is a bottleful (360 c.c., or 12 ounces). For persons presumably easily acted on, one half of the contents of the bottle may be given, and the balance kept in a cool place and well stoppered, to be administered in two or three hours if the first dose has not produced the desired result. Larger children will take a wineglassful of this solution with relish; and this dose may be repeated every two hours until a satisfactory evacuation has been obtained. Small children or infants should not be given this or any other effervescent medicament, as the unaccustomed appearance of the “spots” in the fluid frightens and repels them.

“*Seidlitz Powders*” (*Compound Effervescing Powder*) represent an ingenious method of obtaining an effervescing preparation of excellent keeping qualities. The effervescing ingredients (sodium bicarbonate and tartaric acid) are simply kept separate by being wrapped in powder papers of distinctive color—white for the acid, blue for the alkaline powder—to the latter of which are added 8 gm. (2 drams) of sodium and potassium tartrate. Just before taking, they are mixed in half a tumblerful of water. By having the water ice cold, and adding lemon juice and sugar to it, the dose may be made fairly palatable. One pair of powders is a rather mild aperient. Two pairs may be taken at one time, if required; or the dose may be repeated

every three or four hours until the desired effect is obtained. A patient who is nauseated will probably not retain the whole dose given at once; but, when each of the powders is divided into fourths and this given in half a wineglassful of water every fifteen minutes, one may succeed in "settling" the stomach and producing an evacuation of the bowel at the same time.

*Effervescent purgative salts* are nothing more or less than a mixture of sodium bicarbonate and tartaric acid with the purgative saline—preferably sodium phosphate. All that is required for fair keeping qualities is that the ingredients be dry and be kept dry. Granulation is nonessential.

Finally, the saline may be added to carbonated water from a siphon bottle. In this manner, *magnesium sulphate*, the cheapest, most powerful, and most widely used of the salines, may readily be administered in its best disguise, namely, in form of ice-cold effervescing lemonade made without sugar, for the bitter-sweet taste is even more obnoxious than the bitter. Thus, a tablespoonful of Epsom salt may be mixed in a tumbler with a tablespoonful of lemon juice, a little cold water added for solution of the salt, and then the glass be half-filled with ice-cold carbonated water. Sucking a little lemon before, and drinking a large tumblerful of cold water immediately afterward are still further helpful in overcoming the disagreeableness of a dose of bitter salt.

In view of this abundance of satisfactory administration forms for salines, what justification is there for prescribing proprietary fancy-named products, whose only merit lies in clever advertising? An example of the result of the thoughtless recommendation of nostrums by physicians is "Sal Hepatica."<sup>39</sup>

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39. Sal Hepatica, J. A. M. A. 62: 472 (Feb. 7) 1914.

## MINERAL WATERS

Mineral waters are closely akin to nostrums in the manner in which many of them are exploited. For example, "Pluto Concentrated Spring Water," for which claims are made which in mendacity almost rival those of "patent medicines" in their palmyest days, owes its activity to Glauber's salt, 50 per cent.; Epsom salt, 31 per cent.; cooking salt, 2.5 per cent., with calcium sulphate nearly 3 per cent., and a trace of magnesium carbonate.<sup>40</sup> Does any rational-minded physician believe that he will get better or different results from this combination than he would from an analogous amount of either sodium sulphate or magnesium sulphate? Then why make the patient pay so much more for his "dose of salts"? Whenever physicians are as lavishly supplied with samples as they are with "Sal Hepatica" and "Pluto Water," let them remember that, aside from many other objections to such nostrums, somebody will have to pay a great deal more for the stuff than it is worth and resolve that it will not be their patients.

Experience, forced on us by the war, has shown that we can get along just as well—and, in point of fact, a great deal better—without such world-famed mineral waters even as "Hunyadi" or "Carlsbad."

While taking a mineral water at the springs adds the benefit of climatotherapy to that of pharmacotherapy, it is surely indisputable that whatever virtue is inherent in a mineral water taken at home is innate in its constituents. An artificial combination of these cannot fail to be just as good. Indeed, it is much better; for the physician can then control the constituents in such a way as to make them more suitable to the

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40. Pluto Concentrated Spring Water, J. A. M. A. 60:1013 (March 29) 1913.

individual for whom they are intended. For example: Carlsbad salt is a combination of approximately the following composition: sodium chlorid, 1 part; sodium bicarbonate, 2 parts; sodium sulphate, 4 parts. The combination of alkali with cathartic saline must be admitted to have peculiar virtues. For one thing, it is better borne by the stomach of most dyspeptics than is the simple saline. Furthermore, the alkali has certain therapeutic indications, the consideration of the details of which would lead us beyond the scope of this article, which at times, might well be met in a constipated individual by simultaneous administration of a purgative. The advantage of the possibility of varying the proportions in the salt combination to meet the special indication of these different cases is sufficiently obvious to require further discussion. More than this can, however, be accomplished. There is no reason to suppose that it is impossible to improve on "nature," which, in this case, is nothing but the fortuitous presence of certain salts in the strata of earth through which the water happened to pass. In case of the Carlsbad salt combination, for instance, a great improvement in taste can be secured by substituting sodium phosphate for the sodium sulphate, and sodium citrate for the sodium chlorid, as in this prescription:

	Gm.	
R Sodium citrate .....	15 0	℥ss
Sodium bicarbonate .....	30 0	℥i
Sodium phosphate .....	60 0	℥ii
M. Label: Teaspoonful in a cupful of hot water half an hour before meals.		

This salt formula has secured as good results as have been obtained in suitable cases from Carlsbad salt, natural or artificial. A most important thing to be remembered in prescribing the salts of mineral waters is that the chief ingredient of mineral water is the water.



## CHAPTER XII

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### CALOMEL CATHARSIS

Mild mercurous chlorid is the typical cholagogue cathartic, a term that might be applied to those agents that have a tendency to produce particularly dark or bile-colored bowel evacuations. That certain cathartics, notably calomel, have such action, is a well established clinical observation. Trouble arose when this foundation of fact was left behind and fancy was permitted to assign to these agents a special action on the liver. Nothing seemed more logical than this supposition, though, it appears, nothing is farther from the truth.

It took much investigation and controversy to establish the fact that only a small number of substances increase the secretion of bile and that this does not include any one of the cathartics. The cause of the dark color of the stools following the use of many cathartics is evidently a mechanical one, a more rapid sweeping of the contents out of the intestine, so that there is less time for reabsorption of bile and change in the color of bile pigment. In the case of calomel, to this must be added the fact that grayish-green stools occur even when no bile enters the intestine, owing to the formation of colored mercury compounds, such as sulphid and oxid. A third factor, which also might have something to do with the bile colored purging produced by calomel, is its preservative effect on bile pigment, demonstrable in the test tube, due to inhibition of putrefactive processes responsible for conversion of bile pigment into fecal pigment.

## MODE OF ACTION

Calomel, being insoluble in the mouth and the stomach, passes through without affecting them in transit. Indeed, one of the chief advantages—as well as disadvantages—of calomel is its inoffensiveness to palate and stomach. It is one of the few purgatives that can be given in spite of nausea and vomiting. At times it stays in the stomach when nothing else will. On the other hand, the ease with which this subtle poison can be given invites its abuse, especially in children.

As soon as the calomel enters the intestine, it is attacked by the alkaline pancreatic and intestinal juices, which decompose it into mercury and yellow mercuric oxid. The latter dissolves slowly and incompletely in the alkaline intestinal fluid. The small quantity of mercuric ions thus liberated excites peristalsis and, at the same time, inhibits absorption of fluid. These effects are so much greater in the small intestine than in the colon that calomel is unreliable as a cathartic. The abnormal amount of fluid in the large intestine may be completely reabsorbed, giving rise to diuresis instead of catharsis, unless this reabsorption is inhibited by a saline purgative. Hence, administration of a saline cathartic in connection with calomel catharsis has come to be an established custom. As calomel acts slowly, requiring from ten to twelve hours, while the salines produce their effect in about two hours, the two agents are usually given with an interval of eight or ten hours between them: generally, the calomel at night, and the saline in the morning.

Unfortunately for its use as a cathartic, some of the calomel becomes absorbed, giving rise to the danger of mercurial poisoning, which is much more influenced by the length of time the mercury stays in the bowel

than by the size of the dose: for, when the calomel is promptly swept out of the intestine, it is safe in almost any dose; while a small amount may lead to poisoning, if, by reason of intestinal obstruction or other delay in evacuation, the calomel becomes absorbed to any great extent. Another factor that influences absorption is the presence of solvents. Particularly objectionable is iodid, which, even when taken separately or previously, changes calomel into mercury (metallic) and mercuric iodid and readily dissolves the latter. This change results in a great increase in local irritation—wherever the calomel comes in contact with the iodid—and in greater absorption of mercury. Bromids and alkalis are less obnoxious in conjunction with calomel. Alkali, in the form of sodium bicarbonate, is frequently combined with calomel on the supposition that this increases the efficacy of the latter. The increase in solubility of calomel under the influence of chlorid or hydrochloric acid, under the conditions that prevail in the system, is so slight as to be of no toxicologic importance. An investigation by the A. M. A. Chemical Laboratory<sup>41</sup> showed that the combination of calomel with antipyrin becomes dangerous in the presence of sodium bicarbonate, as, in such a case, from one sixth to one fourth of the calomel may become converted into a soluble mercury salt. The idea that acid drinks, such as lemonade, should be avoided in conjunction with calomel has been shown to be erroneous.

#### CALOMEL POISONING

It is not necessary, in this place, to draw the picture of calomel poisoning. Suffice it to say that this condition affects most especially the two ends of the

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41. The Incompatibility of Antipyrin, Calomel and Sodium Bicarbonate, J. A. M. A. 56: 287 (Jan. 28) 1911.

alimentary tract: the mouth and the colon, and that the kidney is next in order. In the mouth, it produces ulcerative stomatitis, which somehow is connected with the presence of teeth, especially carious teeth. Toothless infants do not develop it. The necrosis starts at the dental margin of the gums and where the teeth are in relation with lips, cheek and tongue. The fact that mercurial stomatitis is characterized by a pathologic condition similar to that of ulcerative stomatitis and Vincent's angina should render calomel contraindicated in the presence of these conditions. If a patient has ever been salivated, calomel should not be used again, for he is liable to show exceptional susceptibility. As mercurial colitis is characterized by a symptomatology and even a pathology much like that of dysentery, one should be cautious, when using calomel in dysentery or enterocolitis, not to confound the symptoms produced by calomel with those of the disease. In these conditions, its continued administration should certainly be avoided. As mercury has a great affinity for the kidney, calomel should not be employed, excepting with the utmost precautions, as a cathartic in kidney disease, unless it be in a syphilitic. In certain cases of nephritis, even a small dose of calomel may precipitate uremia.

As calomel is so unreliable a cathartic that it needs be associated with other purgatives to secure its evacuation, as it is liable to act as a poison, and as we have an abundance of satisfactory nontoxic cathartics, the use of calomel as a mere purge is unjustifiable. Of course, in a patient suffering from syphilis it might be the cathartic of choice. It might also be of special value as a purge in the presence of vomiting. Calomel should never be given without other indication than

simple constipation. It is absolutely unsuitable for self-medication by the laity.

The main reason for its popular use as a purge is its alleged action as an intestinal antiseptic. That it is not an intestinal disinfectant is generally admitted, nor has its action as an intestinal antiseptic been definitely proved.

#### INDICATIONS

As calomel is so inoffensive to the stomach, it is the purgative *par excellence* in the presence of nausea or vomiting, provided one is certain that intestinal obstruction does not exist.

Calomel finds its classical employment in "biliousness," a syndrome that follows indiscretions in diet, whether it be excessive indulgence in food by a healthy person or mere relative excess in an invalid. This condition is characterized by yellowish coated tongue, fetid breath, anorexia, headache, lassitude, subicteric tinge of skin and conjunctivae, and highly colored, scanty urine. But the chief indication for it is believed to be the presence of clay-colored stools, whether there be constipation or diarrhea; and, for reasons given above, it will certainly change the color. Whatever the exact pathology of the condition, free purgation is usually followed almost immediately by amelioration of symptoms; and calomel-saline purgation is believed to be more efficient in this condition than the use of other evacuants. Indeed, its very efficiency is a danger: for it encourages the patient to continue in his overeating, knowing that he can escape the punishment or greatly mitigate it by his dose of calomel. This abuse of the digestive and eliminative organs cannot but lead in time to chronic degenerative changes, insidious in onset but incurable when present. How

much better for an individual inclined to "biliousness" to limit his food intake to his digestive capacity than to gorge himself with food only to purge himself of the excess after it has commenced to harm his system. In view of the remarkably slight intestinal irritation produced by a therapeutic dose, calomel is often employed in summer diarrhea and in dysentery. In these conditions, castor oil is preferable, unless coexisting nausea or vomiting renders the administration of the oil impossible. For reasons previously given, it should be used merely as an initial course. Prolonged administration might increase the damage.

Calomel is employed, by many physicians in a routine manner, as the initial purge in acute febrile conditions of all kinds. Experience in such cases, both with and without calomel, does not demonstrate any difference in favor of those patients that had received calomel. One sees, on the other hand, every now and then—fortunately but very rarely—cases of mercurial stomatitis as the result of this practice, most commonly perhaps among patients who have had a succession of different medical advisers and a succession of "initial" doses of calomel. Hence, when one is not the first to be called on the case, it is best to omit the dose of calomel; and it would probably be just as well to omit this dose on the principle of *nil nocere* in other cases likewise.

#### ADMINISTRATION

So called "broken dosage" is, at present, the method of choice in the giving of calomel. The advantage claimed for it is a greater effect from a total small dose than could otherwise be obtained, each instalment coming in contact with fresh portions of solvent. At the same time, there is less danger of poisoning if the

total dose is retained and absorbed, than if a dose of 0.60 gm. (10 grains) were given. Whether the total dose of from 0.06 to 0.12 gm. (1 to 2 grains) is given in portions of 0.006 gm. ( $\frac{1}{10}$  grain), 0.010 gm. ( $\frac{1}{6}$  grain) or 0.030 gm. ( $\frac{1}{2}$  grain) at intervals of fifteen minutes, thirty minutes or an hour is chiefly a matter of convenience; though, it is claimed that, in the presence of vomiting, the smaller dosage and longer intervals serve best. The rule is sometimes given that the dose of calomel for children should be once or twice as many centigrams ( $\frac{1}{6}$  grain) as the age of the child in years. In practice, however, but little difference usually is made between the dose for the child and the dose for the adult; for, in either case, only that portion of the dose becomes active that is dissolved; and this depends on the amount of alkaline digestive secretion, which is proportionate to the size of the individual. Nevertheless, some such rule as that given prevents the administration of large excess; provided, of course, the adult dose is not exceeded, which will be reached according to the rule at the age of 3 or 6.

Owing to the smallness of the dose and the heaviness of the calomel, a diluent is necessary in prescriptions for calomel powders. Sugar, sugar of milk, or sodium bicarbonate are the usual diluents.

	Gm.
R Mild mercurous chlorid .....	0 06
Sugar of milk .....	0 24
Mix and divide into four powders.	
Label: One every half hour.	

For children, sugar is the preferable diluent. However, the most elegant way of prescribing calomel is in the form of sweet tablets, each containing 0.006 gm. ( $\frac{1}{10}$  grain) and up, which are now marketed by nearly all manufacturing pharmacists.

## CHAPTER XIII

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### RHUBARB

Rhubarb \* might be called the "constipating purge"; it presents a remarkable combination of constipating and purgative action, since it contains tannic acid and a resinous body, which, on hydrolysis, yields various purgative anthraquinon derivatives (rhein, emodin, chrysophanic acid, etc.). The latter may also exist partly free. In addition, this drug contains a large amount of calcium oxalate, which accounts for its "grittiness" when chewed.

#### MODE OF ACTION AND INDICATIONS

With small doses (up to 0.3 gm., or 5 grains), the astringent action predominates; with gram doses (15 grains or more) the purgative action is brought out, a mushy evacuation resulting in from six to ten hours, followed by a greater tendency to constipation than is the case with most other purgatives. When used in sufficiently large doses to be a reliable cathartic, rhubarb is a distinct irritant to the intestine; hence it is contra-indicated in such conditions as enteritis or mucous colitis.

Authorities differ regarding the use of rhubarb in chronic constipation. Some consider it especially indicated in this condition, because—as is the case with other anthraquinon cathartics (cascara sagrada, senna, aloes)—habituation does not readily occur. Others, and

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\* Rhubarb is the rhizome of an Asiatic plant, related to but by no means identical with the "rhubarb" or "pie-plant," the juicy stems of which we use in cookery. Eating of these has, therefore, merely the laxative value of cellulose food, and will, of course, not give one the purgative action of the official rhizome.



with greater cogency of reason, condemn rhubarb as one of the worst of all cathartics in chronic constipation, because of its tendency to leave constipation as an after-effect. We may safely conclude that chronic rhubarb purgation is a misuse of the drug. It surely cannot cure chronic constipation; and it might make it worse.

Rhubarb is claimed to be especially indicated in those cases of delicately poised enteric function, occasionally found in feeble women and children, characterized by a tendency to diarrhea following the use of any other purgative. Rhubarb knows when to "stop." The introduction of such nonirritating physical laxatives as liquid petrolatum and agar, which cannot cause excessive action, has rendered rhubarb much less important in such cases.

The chief use of rhubarb is in the milder diarrheal disturbances, especially of infants and children. On the other hand, in the severer diarrheal disorders, when there is actual inflammation of the intestine, rhubarb would be contraindicated because of the possibility of its acting as an irritant. When the intestinal tract contains curds or other unsuitable or indigestible food, which produces colic and diarrhea in the course of "nature's" efforts at evacuation of the irritant, rhubarb is a remedy *par excellence* to reinforce the salutary tendency to evacuation, and to antagonize, by its astringent action, an excessive prolongation of the diarrheal discharges. For this purpose the *aromatic syrup of rhubarb* is usually administered, and with good reason. Here is a pharmaceutic masterpiece in efficiency of drug disguising. Children delight in taking it. It is so weak a preparation—representing only 3 per cent. of the drug—that it can be given in teaspoonful doses even

to infants. For adults it is too feeble in action. The following is Kerley's <sup>42</sup> schedule of dosage:

#### DOSAGE OF AROMATIC SYRUP OF RHUBARB

6 months .....	4 c.c. (3 i )
18 months .....	8 c.c. (3 ii )
3 years .....	12 c.c. (3 iii)
5 years .....	16 c.c. (3 iv)

For children, this is the rhubarb preparation to be preferred to all others, unless the sugar contained in it should render it objectionable, as in excessive intestinal fermentation. In such cases, an equivalent amount of the aromatic tincture of rhubarb, of which the syrup contains 15 per cent., might be substituted; and benzo-sulphinid (saccharin) used for sweetening, as in this prescription:

	Gm. or C.c.
R̄ Benzosulphinid .....	0 03
Sodium carbonate .....	0 03
Aromatic tincture of rhubarb.....	4 50
Water .....	30 00
to make	
Dosage same as that of the syrup.	

This drug has the reputation of being "good for the stomach." It would no doubt be as difficult to bring objective proof for this action as it is for that of other so-called stomachics. Its not unpleasant bitter, aromatic taste and its astringent effect would entitle it to rank among the astringent bitters were it not for its purgative properties. This combination of qualities possessed by it renders rhubarb superior to other astringent bitters in some cases of dyspepsia complicated with constipation. For this purpose, owing to the stomachic qualities of the alcohol contained in them, one of the tinctures, the tincture of rhubarb (20 per cent., spiced with cardamom) or the more pleasant aromatic tincture (also 20 per cent., flavored with cinnamon, clove and

42. Kerley, C. G.: The Treatment of the Diseases of Children, Philadelphia, W. B. Saunders Company.

nutmeg) would be employed in teaspoonful doses—more or less, according to the effect on the bowels—taken in a little water half an hour before meals. This treatment is, of course, suitable only in “atonic” conditions, and would be contraindicated by a state of excessive irritation or irritability.

#### SIDE EFFECTS

As the rhubarb stools have a “bilious” appearance due to the presence of the coloring matters of rhubarb, it was formerly classified as a cholagogue, and special indications were constructed for it based on this supposed action on the liver. We now know that it is not a real cholagogue, and that whatever benefits are obtained from its use in liver disturbances are due to its cathartic action. It must be remembered that, owing to the chrysophanic acid it contains, rhubarb imparts to the urine a yellowish color, which may lead one to suspect the presence of icterus. This urine may be distinguished from that of jaundice by the fact that it becomes purplish red on the addition of an alkali. Rhubarb renders the milk of nursing women laxative to the child. The drug has been known to cause macular, vesicular and even hemorrhagic eruptions, though such effects are rare.

#### METHOD OF ADMINISTRATION

For solid administration forms, powdered rhubarb is to be used. The *extract of rhubarb* is undesirable, as it is unreliable in action. The active principles are so easily injured by heat that the extract may even be less efficient than the powdered root.\* Soap forms a good excipient for rhubarb pills. This prescription might serve as example:

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\* For the same reason the use of the fluidextract of rhubarb is very limited.

	Gm. or C.c.	
Rhubarb, powdered .....	6 0	gr. xc
Soap, powdered .....	2 0	gr. xxx
Water.....enough to make a mass	i	
Mix and divide into 30 pills.		
Label: One or two after each meal.		

Each of these pills contains only 0.20 gm. (3 grains) of rhubarb; and more than 0.30 (5 grains) could hardly be given in pill form, on account of the necessary limitation in the size of pills. Hence, when larger doses are required, the powder form must be employed, though the powder might be disguised by enclosing it in cachets, each of which may be made to contain up to 0.60 gm. (10 grains) of the powder. Some persons actually enjoy chewing rhubarb; and little cubes of the rhizome are on the market, especially suitable for this purpose.

#### RHUBARB AND ALKALI

The addition of alkali prevents precipitation when an alcoholic preparation of rhubarb is mixed with water. This is the reason for the presence of a small amount of potassium carbonate in the syrup of rhubarb. There are numerous other compound rhubarb preparations, however, in which alkali is used for synergistic or for cooperative action.

*Compound rhubarb powder*, also known as Gregory's powder, is a mixture of:

Powdered rhubarb .....	25 gm.
Magnesium oxid .....	65 gm.
Jamaica ginger .....	10 gm.

We have here the evacuant action of the rhubarb, which acts chiefly as stimulant to peristalsis, reinforced by the laxative action of the magnesium ion, which acts by retaining fluid in the bowel. In addition to this, the antacid action of the magnesium oxid is of value in excessive intestinal acidity, which is frequently present in the summer diarrheas of infants and children. The

dose of this powder for an adult would be from 2 to 4 gm. (one-half to 1 dram); for a child 2 or 3 years old, from 0.3 to 0.6 gm. (5 to 10 grains). This powder is, however, far from being palatable. Adults will take it, but children only with protest and often only after a struggle. In this connection, two axioms on children's medication might be laid down:

1. A struggle in administration sometimes does more harm than the medicine can do good.

2. The more we know about medicines, the less offensive is our medication.

That it is not necessary to inflict Gregory's powder on the sensitive palate of a child is shown by a prescription that offers all the effects obtained from the powder in an actually delicious form:

	Gm. or C.c.
R̄ Magnesia magma .....	30
Aromatic syrup of rhubarb.....	30
M. Label: Teaspoonful every two hours.	

The proportion of the ingredients, size of dose, and frequency of repetition of dose may, of course, be varied to suit the individual case. The previously described saccharinated substitute might be used instead of the syrup in cases in which sugar would be contraindicated.

"*Rhubarb and soda*" is quite a popular stomachic remedy, and deservedly so. It is a veritable gastric polychrest, combining the previously detailed effects of rhubarb in dyspepsia with those of baking soda, which is probably the single most efficient temporary remedy against gastric distress. Rhubarb and soda tablets are marketed by various manufacturers. They are the most convenient form for administration of this remedy to the average dyspeptic. This prescription might be useful:

	Gm. or C.c.	
R Powdered rhubarb .....	10	3 iiss
Sodium bicarbonate .....	30	5 i
Oil sugar of peppermint (N. F.) .....	30	5 i

Mix and divide into 30 powders.

Label: One, in hot water, after meals as required.

The oil sugar might be omitted for those who dislike sweet, or for patients with whom sugar disagrees. The 0.60 c.c. of oil of peppermint contained in the oil sugar (2 per cent. according to a general formula in the National Formulary) might be incorporated with the other drugs. For patients who dislike the flavor of peppermint—and there are such—oil of fennel, oil of anise, or any other volatile oil desired might be substituted. Instead of being divided into doses, the powder might be dispensed in a box and the patient directed to take a level or a heaping teaspoonful, as required. This preparation is therapeutically as efficient as, and pharmaceutically much superior to, the old and now no longer official *mixture of rhubarb and soda*, at present embalmed in the National Formulary under the title of "*Compound Rhubarb Mixture*." The manner in which the extemporaneous preparation may be modified, as indicated above, to suit the needs and idiosyncrasies of the patient proves the undesirability, so often noted in other instances, of ordering a ready made "hand-me-down" mixture.

## CHAPTER XIV

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### PURGATIVE PILLS

Purgative pills are among the "best sellers" in drug stores. This popularity attests to at least some measure of merit; and it must be admitted that pills are a simple, convenient, inoffensive and economical means for obtaining cathartic action. However, these very advantages also contribute to their great abuse, and cause them to lead all other purgatives as creators of the cathartic habit. Because of this, as well as because exact adjustment of dose by the physician and its gradual reduction by the patient are not as readily accomplished with pills as with other administration forms, prescriptions for purgative pills should not be given to patients unless there are positive indications for them. The triad of the careless routinistic doctor, the ignorantly "counter-prescribing" druggist, and the blatantly advertising proprietary pill promoter is responsible for having made a large number of persons "colonic" cripples — life-long slaves to pills.

### INDICATIONS

Purgative pills are convenient for occasionally stimulating bowel evacuation in bed patients. There can hardly be an objection to such employment. But the habitual use of pills is justifiable only when the patient's constipation is hopeless so far as cure is concerned. This condition may exist in the toothless aged, who cannot or will not use artificial dentures, and who, therefore, do not eat enough coarse food to stimulate the bowel to proper function. It also exists in the multiparous woman, who has sacrificed the integrity of her abdominal muscles to her progeny and who, by

reason of insufficiency of abdominal pressure, demands an increase in the motor activity of her intestinal musculature, which, unaided, is not equal to the task.

Sedentary habit, on the other hand, is no justification for purgative pill enslavement, unless heart disease or other physical defect renders a sufficiency of muscular exercise impossible. The attempt to purchase freedom from some of the ills of sluggish habits of life by the habitual use of "liver" pills should be deprecated; other important organs besides the bowel functionate below par in the sedentary person.

When it is a question of the use of the crutch or not walking at all, we choose the crutch as the lesser of the two evils — and so it is with purgative pills. In case chronic use becomes a necessity, pills are superior to all other administration forms of cathartics, chiefly on account of their convenience.

#### PILL ECONOMY

To minimize as much as possible the use of purgative pills, patients should be directed to use a pill at the end of any day on which they have not had bowel evacuation. The patient will then not take the pills oftener than once every other day; and, not as often, should a spontaneous tendency to bowel movement manifest itself. Thus the patient will have a thorough bowel evacuation at least every other day.

The important thing is to fit the patient as exactly as possible with the agent or agents best suited for him and in the smallest dose required by him. There is no sense in prescribing too mild a pill, and having two or three of these taken for an indefinite time, when one pill of exactly the required strength might as well be prepared. This is one of the chief objections to ready-made pills, even though they be official.



## PRINCIPLES OF PILLS CONSTRUCTION

While *curare cito, tuto et jucunde* is our aim, simple prescriptions must be preferred to complex prescriptions, provided they produce as good results. The more complex the remedy, the more unmanageable and liable to unforeseen complications does it become. Nowhere is the principle of simplicity in prescribing more sinned against than in connection with cathartic pills.

The two chief reasons for combination are: mutual reinforcement, and the antagonizing of undesirable side effects. Mutual reinforcement is best obtained by what might be called "*heterotopic synergism*," i. e., the cooperation of agents affecting different functional subdivisions of the organ to be acted on, whereby a result may be obtained with smaller dosage of each of the ingredients than if they were employed uncombined.

## FUTILITY OF THE A. S. B. COMBINATION

A good example of an attempt at "rational" combination for both these effects is the "A. S. and B." pills (Pills of Aloin, Strychnin and Belladonna, N. F.).

Nothing may seem more logical than to add to the aloin some strychnin for the purpose of increasing the irritability of the motor neurons on which the aloin is to act; nor might it seem that anything would be more suitable to counteract the reputed tendency of aloes to produce griping than the powerful antispasmodic, belladonna. Unfortunately, by utilizing them in pill form at the same time, they cannot possibly act together, because of the different speed and duration of action of the three agents. Aloin is slow in action, requiring from ten to twelve hours—that is why it is generally given at bedtime. Strychnin and

atropin, on the other hand, are rapidly absorbed and rapidly excreted, having but a brief duration of action. No experienced clinician would expect either of these alkaloids to act for more than four hours. By the time the aloin gets its action in, the alkaloids have long since left the system by excretion into the urine.

To put these theoretical considerations to the experimental test, more than thirty volunteers in a class of medical students were given two pills each to be taken with an interval of about a week. One of these contained aloin; the other, the same dose of aloin and some extract of belladonna in the quantities found in the A. S. and B. pills. Strychnin was omitted, to reduce the experiment to its simplest terms. The pills were called No. 1 and No. 2 pills, and the experimenters did not know which of these contained the belladonna. They were asked to distinguish its presence by difference of action. The majority could not notice any difference whatever; a few thought the belladonna-containing pills were the ones that produced more griping; a few, that the simple aloin pill acted more disagreeably. Clinical use of the official *Pills of Aloes*, containing 0.13 gm. (2 grains) each of aloes and of soap, as compared with similarly extensive use of the A. S. and B. pills, did not demonstrate any greater tendency to griping displayed by the one than the other.

Admitting that the number of observations in the experiment just noted is too small for positive deductions—it ought to be repeated over and over again and would be quite as instructive as some of the animal experiments performed by medical students—the results, as they stand, support the theoretical deductions based on the relative time of action of the ingredients. After all, griping is a matter of size of dose, sensitiveness of individual, and condition of enteric contents rather than of name of drug.

It is gratifying, therefore, that the *Compound Laxative Pills* (U. S. P. VIII) similar in composition to the A. S. and B. pill, with the no doubt uncalled-for

addition of ipecac, were deleted from the present pharmacopeia. However, these pills as well as the *Compound Pills of Aloin, Strychnin and Belladonna*, N. F., containing some extract of cascara, in addition, are still extensively used.

Rather popular at the present time also are the unofficial "*Cascara Compound Pills*," commonly called "Hinckle's Pills," each containing:

	Grain
Cascara .....	$\frac{1}{4}$
Aloin .....	$\frac{1}{4}$
Resin of podophyllum .....	$\frac{1}{8}$
Extract of belladonna .....	$\frac{1}{8}$
Strychnin sulphate .....	$\frac{1}{80}$ – $\frac{1}{120}$
Oleoresin of ginger .....	$\frac{1}{8}$

One wonders whether they are popular because their formula is not contained in the U. S. P. and N. F.—it has been said facetiously that the best way to destroy the popularity of a preparation is to make it official. Efficiency is, of course, granted to these as well as to all the other aloes pills, no matter what their composition. The question is as to the desirability of such polypharmacy.

#### OBJECTIONS TO COMPOUND CATHARTIC PILLS

The official compound cathartic pills are no less undesirable. The chief objection is that they contain a considerable amount of calomel, and that people may buy them freely in drug stores and use them indefinitely, not knowing that they are poisonous. Every now and then cases of calomel poisoning can be traced to the compound cathartic pills, taken by some misguided layman for the benefit of his "liver." In drug stores the custom exists quite generally of dispensing the *Vegetable Cathartic Pills* of the National Formulary—also known as "Compound Cathartic Pills, Improved"—when people call for

compound cathartic pills without a prescription.\* The "improvement" consists in the substitution of podophyllum and leptandra for the calomel and gamboge, and in the addition of extract of hyoscyamus and oil of peppermint, so that the "improved" pills boast of ten different ingredients: aloes, extract of colocynth, cardamom seed, resin of scammony, soap, extract of hyoscyamus, resin of jalap, extract of leptandra, resin of podophyllum and oil of peppermint. These are far too many ingredients to meet the demands of scientific combination, namely, that each ingredient improve the action in a demonstrable manner. No one, so far as is known, has even attempted to render this demonstration for either of these pills; and while some of the ingredients might conceivably reinforce each other, that which has not been demonstrated has no existence in science. In this demonstration, aloes and each of the other ingredients would have to be compared when given separately and when combined with each other in all possible different variations. This would require, with eight ingredients, more than fifty different sets of experiments, each of which should probably include from fifty to 100 observations. Until such a demonstration proves otherwise, these combinations must be considered unscientific.

#### ALOES

When prescribing a purgative pill, all that is really necessary is to order a sufficient dose of aloes. On account of its reliability, the fact that it does not lose its efficiency on prolonged use, and the relative smallness of its dose, aloes is the practically universal ingre-

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\* These "improved" pills were deleted from the pharmacopeia at its last revision. It is to be regretted that the others did not meet the same fate, for they are even more objectionable.

dient of cathartic pills. It is, therefore, worth while to study the peculiarities of this drug somewhat more closely.

As the odor is repulsive and the taste intensely bitter, aloes is unsuitable for administration other than in pill form. Its liquid preparations are therefore of no practical importance. Because of their nauseous odor, even its pills are disagreeable unless coated. When extemporaneous pills are prescribed, the mass should always be put into gelatin capsules.

*Mode of Action.*—It is a curious fact that the glucosids of which aloes is composed are inactive until they become decomposed into sugar and anthraquinon bodies, such as emodin, on which the activity of aloes depends. It is evidently because of the necessity for this change, which occurs in the intestine, that aloes is so slowly acting a purge. From eight to twenty-four hours may elapse before the effect occurs. Hence, it is generally administered at bedtime; though, as the active ingredient of so-called "dinner-pills," it is sometimes given with meals, whether before or after probably does not matter.

The conversion of the glucosids of aloes into the active bodies is favored by alkalis, including soap, and probably also by bile. This is the reason for the presence of an equal amount of finely powdered soap in the official pills of aloes, which contain 0.13 gm. (2 grains) of each of these ingredients. It is also believed that the activity of aloes is increased by iron salts; this is ascribed to their oxidizing tendency. Aloes is frequently prescribed in combination with iron in the treatment of anemia, as it at one and the same time antagonizes the constipating tendency of the iron and the tendency to constipation in the anemic patient. For this purpose a small dose of aloes, say from 0.005 to

0.010 gm. ( $\frac{1}{12}$  to  $\frac{1}{6}$  grain) might be added to each one of Blaud's pills (pills of ferrous carbonate).

Aloes is a peristaltic stimulant acting chiefly on the colon. It is capable of producing purgation, when applied to raw surfaces or when given hypodermically. However, being a local irritant, it produces too much pain and inflammation to be useful as a hypodermic cathartic. When taken by a nursing woman, it may act as a purge to the babe.

Aloes has the reputation of causing collateral pelvic congestion, for which reason some consider it unsuitable for patients with hemorrhoids. However, this contraindication is certainly not absolute. Many persons who have hemorrhoids take it not only without harm but with actual benefit in the prevention of acute inflammatory disturbances by securing regular and sufficient bowel evacuation. Constipation and violent purgation must alike be avoided by the person with hemorrhoids. Patients suffering from an acute inflammatory complication of hemorrhoids are distressed by any bowel evacuation, and this distress is the greater as the evacuation is more profuse. Such patients do not tolerate active purgation of any kind, and perhaps least of all that produced by aloes.

On account of the pelvic congestion which aloes is assumed to cause, aloes is believed to be of value in amenorrhea, and to be shunned in excessive menstruation, tendency to uterine or other genital hemorrhage, and in pregnancy. While ordinary doses of aloetic pills fail when used as abortifacients, it is advisable to bow to popular prejudice, and to use for pregnant women some other cathartic, such as cascara sagrada or sodium phosphate.

*Dose and Administration.*—When aloes is to be used for the purpose of increasing colonic irritability in a

case that is not considered one of hopelessly incurable constipation, it is best given as a "dinner pill," with meals. When it is thus given, the unit pill of aloes of 0.10 gm. (practically 2 grains, the size of the official pills) is likely to be larger than necessary, and half a dose or less may suffice. Such pills might, for instance, be thus prescribed:

	Gm.	
R Powdered aloes .....	1/50	gr. xxiii
Powdered soap .....	1/50*	gr. xxiii
Mix. Make a mass, and divide into 30 capsules.		
Label: One three times a day after meals.		

If this daily dose be insufficient, the patient may be directed to use two or three of these pills, as required, and to return for another prescription when the quantity prescribed has been consumed. After regularity of bowel evacuation has been secured by means of such pills for a week or two, one dose a day is dropped weekly or monthly, as the case may permit, provided the desired effect continues; and, in this way, the cathartic habit may be avoided.

When failure of faithful and repeated trial renders it apparent that the patient seems incurably constipated, then it is best to give him a prescription for pills of sufficient size to secure a thorough evacuation when one daily dose is taken. Such a pill is to be administered at bedtime on the day the patient has been without bowel movement. The patient may be encouraged to make an attempt at stool daily after breakfast. This, as will be seen, makes for economy in pill consumption, and expresses, at the same time, our reluctance to permit the patient to rely entirely on the action of the pills. The patient, however, should also understand that a thorough bowel evacuation every other day is entirely sufficient for most individuals.

There is little actual need for concentrated aloes preparations, as the dose of aloes usually required is

sufficiently small to permit the preparation of pills of proper size. This is evidently the reason why purified aloes and the extract of aloes (which has twice the strength of aloes) were deleted from the present pharmacopeia. *Aloin*, which is a mixture of pentosids, is often active in so small a dose, average 0.015 gm. ( $\frac{1}{4}$  grain), that inert powder has to be added to it to make a pill of proper size. In such a case, aloin is obviously of no advantage, as we must pay the manufacturer for removal and waste of perhaps 90 per cent. of material from aloes, most of which is far from being inert. Aloin presents advantage only in a case that would require an aloetic pill of excessive size. For such a one, a pill of aloin of 0.1, 0.2, or even 0.3 gm. may have to be prescribed.

#### PODOPHYLLUM

Podophyllum was introduced by the "eclectics" during the period when these practitioners endeavored to substitute drugs of "kindly" action for those drugs, used by the "regular school," that were harsh and dangerous when employed without the necessary admixture of brains. Calomel was anathema to them, and not without cause. So they hunted for a substitute for this drug, and believed they had found it in podophyllum, which came to be known as the "vegetable calomel."

One of the points in which podophyllum resembles the mild mercurous chlorid is the comparative insolubility of its resinous active principles in the acid stomach and their solubility in the alkaline intestinal secretions. As in the case of calomel, its action seems to be especially exerted on the upper portion of the small intestine. Thus, Ringer quotes some dog experiments by Anstie in which it was found that, after injection of an alcoholic solution of resin of podophyl-



lum into the peritoneal cavity, the small intestine, especially toward the lower end of the duodenum, was extremely congested; and, in some instances, the lower part of the duodenum was extensively ulcerated. The large intestine was but slightly engorged. Although the injections were poured into the abdominal cavity, the peritoneum itself was not at all inflamed, even around some unabsorbed granules of the resin.

*Mode of Action.*—Podophyllum is an irritant to skin and mucous membranes. It tends to act as a purgative even when applied to ulcers or raw surfaces, or when given hypodermically, though the local irritation produced precludes its practical employment in this manner. It must be classified as a drastic cathartic in view of the fact that overdosage produces gastro-enteritis. A sufficiently small dose, from 0.003 to 0.006 gm. ( $\frac{1}{20}$  to  $\frac{1}{10}$  grain) of the resin, produces merely laxative effect; in doses of 0.008 to 0.030 gm. ( $\frac{1}{8}$  to  $\frac{1}{2}$  grain) this resin is an active purge. A single dose of 0.05 gm. (1 grain), or a daily dose of 0.10 gm. ( $1\frac{1}{2}$  grains) should not, as a general proposition, be exceeded. Excessive dosage may produce bloody and slimy stools, especially in children. It may occasion, even in medicinal doses, considerable colic and sometimes nausea. Podophyllum has little tendency to produce after-constipation. Hence it is suitable for prolonged use.

Unfortunately, it is a rather uncertain cathartic, a dose, adequate to purge one person violently, being inoperative in another. Its dosage, therefore, should be small at first and gradually increased as necessary. Likewise does the time required for action vary from a few hours to twelve or twenty-four hours or more. Combination with some other agent, such as aloes, might rectify some of these defects.

*Indications.*—Podophyllum is worth a trial in cases of “biliousness,” especially those of the frequently recurring type, in which the repeated administration of calomel would be contraindicated because of danger of mercurial poisoning. The syndrome of “biliousness” need not be present in its full evolution. Thus, certain types of sick headache are relieved by agents of this class better than by anything else. So may certain cases of periodically recurring attacks of indigestion. As podophyllum cannot possibly act as an antiseptic—an action that, as we have seen, is doubtful in case of calomel—a more suitable explanation for the special value of the “cholagogues” in “biliousness” than that based on the theory of antiseptic action might be built on Alvarez’<sup>43</sup> theory of “reverse peristalsis.” He believes that the syndrome of biliousness is produced by a focus of excessive irritability in a lower portion of the digestive tube, for instance, a chronically inflamed appendix, which upsets the normal gradient of irritability that should become progressively less as we proceed from above downward. Now it is not unreasonable to assume that some of these purges, with special action on the upper portion of the small intestine, might, by increasing the irritability of the duodenum and jejunum, restore the previously upset “gradient of forces.” This is merely offered as a working hypothesis for experimentation. It cannot as yet be even dignified with the term theory.

*Method of Administration.*—The resin of podophyllum is the only preparation of this drug that should be employed. The name “podophyllin” has been applied to this mixture of alcohol-soluble and water-insoluble

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43. Alvarez, W. C.: The Syndrome of Mild Reverse Peristalsis, J. A. M. A. 69: 2018 (Dec. 15) 1917.

principles. In view of the desirability of limiting the ending "in" to pure principles, the use of this word in the present popular sense is unscientific, and should be abandoned. Let us remember that habits of speech produce and reflect habits of mind. Furthermore, there is so great a difference in the strength and dosage of "podophyllum" and "podophyllin" and such similarity in the names, that, with the proverbially miserable chirography of prescribers, serious misunderstandings might occur.

Resin of podophyllum may be prescribed in the form of a 1:60 alcoholic solution (1 grain to the dram), one or two drops of which may be given on a lump of sugar to children, three or four drops to adults. It is usually given in the form of pills. However, the nicest way of giving it is in the form of tablet triturates, each containing 0.0006 gm. ( $\frac{1}{100}$  grain), one or two of which may be given every hour for from four to ten doses.

#### COMBINATION OF ALOE AND PODOPHYLLUM

As podophyllum is one of the slowest of all cathartics in action, combination with rapidly acting purgatives is irrational, as is also the case with aloes. On the other hand, combination of podophyllum with aloes impresses one as rational, not only because of similarity in time required for action, but also because of difference in point of chief attack. An experiment should be devised—and might easily be performed by classes of medical students—to test the question whether we have in such combination a real case of heterotopic synergism. Should a patient present a combination of the special indications for these two cathartics, they might be suitably combined in one pill. The National Formulary contains a formula for such a pill under the name,

*Compound Pills of Aloes and Podophyllum*, each of which contains:

	Gm.	
Aloes .....	0 065	gr. 1
Resin of podophyllum .....	0 0325	gr. $\frac{3}{4}$
Extract of belladonna leaves .....	0 016	gr. $\frac{1}{4}$
Extract of nux vomica .....	0 016	gr. $\frac{1}{4}$

For reasons given previously, the last two ingredients might as well be omitted. Not only are they useless, but they might do harm, the belladonna by producing dryness of the mouth, and the nux vomica by increasing the reflex excitability and "nervousness" in neurasthenics. But why give the patient a "hand-me-down" article at any time, when he comes to us for individual measurement and fit? Not only is this not best for the patient, but it is even worse for the physician. By getting into the lazy habit of prescribing ready-made preparations, he loses in aptitude and power of devising combinations of his own. How miserably dependent we become when we practice prescribing according to formularies will be painfully evident to the routine C. C. pill and A. S. and B. pill prescriber, who might desire to reform. But it is worth the effort; and the attempt to get out of the rut should be made before a sclerotic condition of habits of thought and action have made such a change impossible.







